DOCUMENT RESUME

ED 447 664	EC 308 153

TITLE	A Collection of Early Intervention Articles: Family-Centered Service Delivery, Play of Children with Disabilities, Assistive Technology for Young Children. Birth through Two. Let's Play! Project.
INSTITUTION	State Univ. of New York, Buffalo. Center for Assistive Technology.
SPONS AGENCY	Special Education Programs (ED/OSERS), Washington, DC.
PUB DATE	2000-09-00
NOTE	264p.; For related Let's Play! project documents, see EC 308 147-152. Developed by Susan Mistrett, Amy Goetz, Cora Gaff, and Amy Baxter.
CONTRACT	H024B50051
AVAILABLE FROM	Let's Play! Project, University at Buffalo Center for Assistive Technology, 515 Kimball Tower, Buffalo, NY 14214-3079. Tel: 716-829-3141 ext. 155; Fax: 716-829-3217; e-mail: mistrett@acsu.buffalo.edu; Web site: http://www.cosmos.ot.buffalo.edu/letsplay/.
PUB TYPE	Collected Works - General (020)
EDRS PRICE	MF01/PC11 Plus Postage.
DESCRIPTORS	*Assistive Devices (for Disabled); Child Development; Delivery Systems; *Disabilities; *Early Intervention; *Family Involvement; Infants; *Play; Services; Technology; Toddlers; *Toys

ABSTRACT

This collection of journal article reprints was developed by the "Let's Play! Project," a 3-year federally supported project that worked to promote play in infants and toddlers with disabilities through the use of "low-tech" assistive technology. The articles are organized into three groups: (1) play of children with disabilities (seven articles); (2) family-centered services (six articles); and (3) assistive technology (nine articles). Topics covered in the articles include the following: social-cognitive development and toys; play-based assessment; play and communication skills in children with Down Syndrome; play deprivation in children with physical disabilities; play and concept development in infants with severe visual impairments; emergence of social play in infancy; family outcomes in early intervention; family-centered service coordination; early intervention and the parent-child interaction; assistive robotics; family-centered assistive technology decision making; assessing infant environments; and augmentative communication. (Individual articles contain references.) (DB)

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A Collection of Early Intervention Articles

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Family-Centered Service Delivery

Play of Children with Disabilities

Assistive Technology for Young Children

Let's Play! Project
University at Buffalo
Buffalo, NY 14214

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DOE Grant #H024B50051

COLLECTION OF ARTICLES CONCERNING:

- *Play of Children with Disabilities*
- *Family-Centered Service Delivery*
- *Assistive Technology Supports*

BIRTH THROUGH TWO

The Let's Play! Project is funded by the US Department of Education, Office of Special Education Programs; #H024B50051. Funding began June 1, 1995 and continues through May, 2000. Opinions, materials and references to commercial products do not necessarily reflect the opinions or policy positions of the Department of Education, and no official endorsement by the department should be inferred.

ACKNOWLEDGMENTS

This publication was prepared cooperatively throughout the duration of the Let's Play! Project and included the input of several Early Intervention professionals. The following individuals are recognized for their contributions in the development of this document:

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LET'S PLAY! PROJECT

The Let's Play! Project was funded to develop, implement and evaluate a model to promote successful play opportunities for families with children with disabilities in state Early Intervention Programs.

Play is how children grow; it's what they do. Children with disabilities often do not have the skills or the same opportunities to play as do non-disabled babies. This "play deprivation" has been shown to negatively impact the development of physical, cognitive, communication and social skills required for learning. Adding to this problem, the children's parents often do not feel they have permission to take time to play as programs developed for children with disabilities often emphasize therapeutic interventions instead of play. Parents/caregivers *can and must* be an integral part of this process, and return to their more traditional role as play partner, nurturer and teacher. The Let's Play! Model looks to investigate play approaches that start with what the child likes and what s/he can do and then looks for materials and strategies that can augment existing play abilities or compensate for limitations imposed by those disabilities.

In Let's Play!, the keys are in promoting this critical access to play through the use of assistive technology (AT). Typical solutions revolve around "low tech" devices: adaptations to commercially available toys making then easier to activate or access; the use of primarily commercial positioning and mobility items; communication devices; and specialized toys and appropriate switches. These AT items are inventoried within a Play & AT Lending Library and are loaned to the family for use in the home or other natural environments. Families first identify play outcomes and then work together with professionals to identify what items work best to provide successful play options in their homes.

The Let's Play! Project looks to provide ideas and strategies in the use of assistive technologies to facilitate play from birth through toddlerhood. The model has identified methods that empower and strengthen families to foster optimal development of the child. The overall goals of Let's Play! are to give the child and family access to play materials and a variety of play positions, and to address issues of importance to the family. Training, technical assistance and other informational supports are available to encourage Early Intervention Programs to promote play in young children with disabilities with the use AT devices and services.

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PLAY OF CHILDREN WITH DISABILITIES

The benefits of play and the areas of development that can be impacted by play in children are numerous. Play is closely linked with cognitive, emotional, social, communication, and physical/motor development. For infants and toddlers, play is the primary mode for learning about how objects work, and developing the skills they will need to interact with people and objects in their worlds. Success in play means that the child will experience the positive attitudes associated with productivity, satisfactory quality of life, meaningfulness and value; all critical to sustaining success at school and work. Successful play interactions, and successful environmental control, lay the foundation for accomplishment in future learning and work environments.

Children with disabilities often do not have the skills and/or opportunities to play in ways that parallel those of their non-disabled peers. This "play deprivation" has been shown to negatively impact the development of physical, cognitive, communication and social skills required for learning. The influence of play in the child's early years is beginning to effect the type and scope of services offered through state Early Intervention Programs. Service providers often look at play as the function or "occupation of the child" and families voice their desire for "play outcomes" for their children. Evaluation techniques increasingly look to play-based assessments in the home, the natural environment where children and family members interact.

Articles contained within this section address a scope of interventions that can result in the development of increased play interactions in young children with disabilities. Conclusions support play as a natural vehicle to development for all children.

TECSE 5(3), 11-30

Social-Cognitive Development and Toys

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This review examines research and theory pertaining to the relation between social-cognitive development and toys. Empirical research establishes a moderate relation between the availability of toys and children's development throughout early childhood, a relation that appears to reflect more than an association with social status. The relation appears bidirectional and varies somewhat according to sex and race. Several aspects of psychological theory appear to describe part of the relation between social-cognitive development and use of toys. These include cognitive developmental theory (Piaget), theory relating learning and development (Vygotsky and Feuerstein), script theory (Bretherton), theories of intrinsic motivation (Berlyne, Bruner, and Yarrow), and theories relating play to development (Mueller and Dunn).

The importance of the social environment for children's development is widely acknowledged. A rich literature exists describing the relation between cognitive, social, and emotional functioning and various aspects of the social environment. Much less is known about attributes of the physical environment and their relation to children's development. The purpose of this review is to focus on one aspect of the relation between the physical environment and development in children: the relation between play materials and social-cognitive development. The review consists of two parts: (1) a summary of literature that demonstrates the association between play materials and social-cognitive development during childhood; and (2) an examination of several theoretical perspectives that may help to explain the connection between play materials and development.

Findings

Perhaps the most intensive home observational studies of the relation between the presence of toys and materials during the first two years of life and children's cognitive development have been those done by Wachs and his colleagues (Wachs, 1976, 1978; Wachs, Uzgiris, & Hunt, 1971). The first study involved 102 predominantly lower-class children. Observations in the homes of these children revealed that the availability of books and toys during the second year of life was significantly correlated with scores from the Infant Psychological Development Scale at 22 months, but not at 15 or 18 months. Research done on a second sample of 39 children showed a substantial relationship between the number of audiovisually responsive toys and children's performance on object permanence and the development of schemas throughout the second year of life and .6 with IQ at age 30 months.

Clarke-Stewart (1973) did repeated observations of 36 predominantly low SES children and their mothers in home and laboratory settings and assessments of infant competence throughout the period of 9 to 18 months. By age 17 months, children spent an average of 34% of their time interacting with their mothers and about 50% of their time playing with, looking at, and investigating objects (about 20% with toys and 30% with other household objects). Clarke-Stewart observed a correlation of .39 between the number of toys available to the child in the home and a conglomerate measure of competence. Variety of toys was correlated .34 with the competence measure, while the child's actual use of toys and objects was correlated .46. The variety of toys was correlated .47 with Bayley Mental Development Index at 17 months; and the use of toys and objects was correlated .36.

There is also evidence that the availability of toys during infancy is related to later competency. For example, Tulkin and Covitz (1975) found that the number of environmental objects available at age 2 was correlated .40 with middle-class girls' performance on the Illinois Test of Psycholinguistic Abilities (ITPA) at age

6 but not to their Peabody Picture Vocabulary Scores (PPVT). For working class girls, the correlations were .55 with ITPA and .40 with PPVT. Moore (1968) found that the toys, books, and experiences present in London children's homes at age 30 months was correlated .4 and .3 with IQ at age 3 for boys and girls, respectively. Even with social class partialled out, the correlations remained .36 and .14 for boys and girls, respectively. When Moore examined correlations between the age 30 month home environment scores and IQ at age 8, he observed a .6 correlation for both sexes (about .45 with social class partialled out).

Barnard, Bee, and Hammond (1984) investigated 163 working class and middle-class families from the Seattle area. Correlations between the number of play materials scores and cognitive competence during the first 4 years of life were low but significant (.2 to .4). Correlations for children of well-educated mothers were low (.2 to .3). Those for mothers with less than a high school education were a little higher (.3 to .4). Correlations were clearly higher for boys (.3 to .5) than for girls (.2 to .3). When maternal education and SES were partialled out of the correlation between play materials and intellectual competence, some attenuation was noted but the partial correlations remained significant (.2 to .3).

Fewer studies on the relation of play materials and social-cognitive development during the preschool period have been reported. However, as the research by Siegel (1984) demonstrates, the same general pattern appears to hold. She found that the availability of play materials at age 3 showed low to moderate correlations (.3 to .5) with 3-year Stanford-Binet and Reynell Language scores. Five-year scores on play materials were correlated .5 with scores on the McCarthy General Cognitive Index. Ware and Garber (1972) found that the availability of materials for learning in the home correlated about .3 with scores on the Preschool Inventory for Mexican-American and black American 4-year-olds. A study comparing children with language impairments (Down syndrome), children with language delays (no apparent organic basis for the developmental problem), and children with normal language skills showed that the amount and appropriateness of toys during the preschool years significantly differentiated the homes of language delayed and normal groups (Wulbert, Inglis, Kriegsman, & Mills, 1975).

An especially revealing longitudinal study of older (ages 8 to 14) handicapped children was conducted by Nihira and his colleagues (Nihira, Meyers, & Mink, 1980, 1983). It involved 114 trainable mentally retarded children (mean IQ = 42.4, SD = 9.9) from southern California who were living at home. The home environments of the children were assessed with a variety of measures including the HOME Inventory and the Home Quality Rating Scale. Children were assessed by the Adaptive Behavior Scale and parental ratings of social and psychological adjustment. Children's social adjustment was significantly related to the amount of stimulation through toys and equipment.

The Little Rock Longitudinal Study

During the past two decades we have been involved in a research study that has particular relevance for the topic of this report, the Longitudinal Observation and Intervention Study (Caldwell, Elardo, & Elardo, 1972). This study commenced in 1970 and involved approximately 130 children. Approximately 60% of the participants were black, and 40% were white. As Table 1 shows, the availability of appropriate play materials from infancy through preschool was moderately correlated (.4 to .6) to mental test scores from age 3 to age 8 (Bradley & Caldwell, 1976, 1984; Elardo, Bradley, & Caldwell, 1975).

A primary concern of ours was whether the observed relation between the availability of play materials early in life and later mental test scores occurs because of the correlation between early environmental opportunities and later environmental opportunities or because of the particular salience of play materials during the first year of life. The findings for females suggested that the observed correlation between play materials and IQ results because of a stable pattern of environmental opportunities. For males, there was evidence that play materials available during the first year or so of life may have some unique value. For whites, the set of partial correlations indicated that scores on play materials at all three time points contributed about the same to 3-year IQ (.2 to 3). For blacks, later scores on play materials were more predictive than earlier scores.

A second issue we addressed was whether the observed relation between the availability of toys in the first year of life and later IQ might reflect overall differences in the home rather than the availability of play materials per se. Findings suggested that the mere availability of toys may not be sufficient for facilitating intellectual development. Specifically, play materials was significantly correlated with maternal involvement (.61 to .75). Thus, it may be that availability of appropriate play materials, in conjunction with consistent encouragement, may be useful for development.

A third area of focus for our studies was bidirectionality of effect. Cross-lagged panel analyses indicated that the primary direction of effect in the period from 6 to 12 months may be from child to environment (i.e., more capable children elicit more appropriate play materials from their parents). However, in the period from 12 to 24 months, the effects seem about equal in both directions.

A final study utilizing the Little Rock longitudinal sample examined the relation between HOME subscale scores and family demographics when infants were 1 and 2 years old. This study was done to determine the extent to which the environmental processes tapped by the HOME might be attributable to common socioeconomic, family structure, and racial characteristics. For both time points, scores on play materials showed only modest correlations with demographic variables. Also, they were more strongly related to family structure as compared to social status characteristics. In sum, while part of the relation between play materials and social-cognitive development may be attributable to the relation with social status, most of the relationship does not seem attributable to such associations.

Table 1. Correlations between 6-, 12, and 24-month HOME Scores and Mental Test Scores Gathered at 1, 3, and 4 ½ Years

	Time of HOME Assessment							
	6 Months			12 Months			24 Months	
HOME Subscales	**1-yr. MDI[b]**	**3-yr. IQ**	**4½-yr. IQ**	**1-yr. MDI**	**3-yr. IQ**	**4½-yr. IQ**	**3-yr. IQ**	**4½-yr. IQ**
Responsivity	.09	.25*	.27	.15	.39*	.34*	.49*	.50*
Restriction	.13	.24*	.10	.01	.24*	.21	.41*	.28*
Organization	.20	.40*	.31*	.20	.39*	.34*	.41*	.33*
Play Materials	.05	.41*	.44*	.28*	.56*	.52*	.64*	.56*
Involvement	.08	.33*	.28*	.28*	.47*	.36*	.55*	.55*
Variety	.27*	.31*	.30*	.05	.28*	.32*	.50*	.39*
Total Score	.16	.50*	.44*	.30*	.58*	.53*	.71*	.57*
Multiple Correlation[a]	.30	.54*	.50*	.40*	.59*	.57*	.72*	.63*

*$p<.05$; [a] This represents the multiple correlation of all six HOME subscales; [b] MDI – Mental Development Index from Bayley Scales

Play Materials and Social-Cognitive Development

While empirical research clearly establishes a link between a child's encounters with toys and social-cognitive development, no attempt has been made to articulate a coherent, comprehensive set of theoretical propositions concerning the relationship. It is beyond the scope of this article to delineate such a set of propositions. However, an attempt will be made to briefly describe several theories and models that may serve as a partial basis for generating hypothetical patterns of relationship. They are reviewed for their heuristic value in clarifying the role and function of toys in early development. To this end, three major categories of theory are explored: theories dealing with normal cognitive development in early childhood, theories of intrinsic motivation, and theories concerning the role of play.

Theories of Social-Cognitive Development

One of the most obvious sources for ideas regarding the link between play materials and social-cognitive development is Piagetian theory. Since Piagetian theory is generally well known in education, only a few summary comments will be made concerning its potential relevance. To wit, Piaget conceived cognitive development as a dynamic activity whereby a person encounters new stimuli and, through the complementary processes of assimilation and accommodation, restructures his or her current way of understanding. During the period from infancy through adolescence, a person's ability to conceive events and ideas advances through four distinct stages. Upon reaching the fourth stage, formal operations, a person can consider purely abstract ideas and propositions. In early childhood, however, when a child is in the sensorimotor and preoperational stages of development, the ability to comprehend experiences is highly dependent on having an opportunity to directly observe and act upon concrete events and objects. In these stages, the availability of a wide variety of toys and other physical objects that may be explored and manipulated increases the likelihood of a child's developing differentiated concepts.

A contemporary of Piaget's, the Russian psychologist Lev Vygotsky, articulated a theory of learning and development which may have particularly useful implications concerning the value of play materials. Vygotsky was interested in the practical intelligence of infants. His observations suggested that intellectual development was determined "both by the child's degree of organic development and by his or her degree of mastery in the use of tools" (1978, p. 21).

According to Vygotsky, a dialectical unity of tool and symbol systems evolves in children-beginning in the second year of life. Speech joins forces with eye and hand in the solution of practical problems. Vygotsky argued that the convergence of these two systems in early childhood is the single most significant event in the history of intellectual development. In this context, it is important to clarify that Vygotsky does not use the word tool synonymously with the word *object* (or obviously, the words *play materials*). *Tool* refers to the indirect function of an object to accomplish some activity. That is, tools are used to mediate activity. As mediators of activity they are linked to higher intellectual functioning. Two things must be present in order for the marriage of tool and symbol systems to become productive: (1) normal opportunities for the language system itself to develop; and (2) a varied, responsive, and manipulatable object environment. Thus, during the first 3 years of life, play materials and other responsive physical objects provide an arena of opportunities for intellectual development.

Vygotsky proposed that a dynamic, interdependent relationship exists between learning and development in humans. To explain this relationship he introduced the concept of the zone of proximal development (ZPD). According to Vygotsky (1978), the ZPD is the "distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (p. 86).

With respect to preschool children, Vygotsky felt that play settings afforded a particularly rich environment for the creation of zones of proximal development. The potential value of play settings (and for play materials used in play settings) in enhancing social-cognitive development can perhaps best be understood in terms of Vygotsky's ideas on the relation of actions and objects to meaning. Early in life objects dominate meaning and action. Children's behavior is impelled by things and their understanding is driven by inherent features of those things. With advances in cognitive capability, the field of meaning is separated from the field of perception. Then children can use things imaginatively in the service of their motives. The play setting determines the meaning of the object. The tree branch becomes the magic wand. In play, toys and other objects become pivots detaching the meaning of words from the real objects they designate (e.g., in pretending that a stickhorse is a horse, the word "horse" is no longer isomorphic with the real animal it designates). At this point in development, play materials and other objects become vehicles for transporting meaning from real objects and, thereby, for facilitating social-cognitive competence. Thus, the role of toys in play is different from that in infant action. They do not so much dominate as they assist in the development of new meaning. They help to carry out the wishes, intentions, and motivations of the child as they operate in imagination. In essence, play materials and actions provide a channel through which meaning is realized and motivations fulfilled. "From the point of view of development, creating an imaginary situation can be regarded as a means of developing abstract thought" (Vygotsky, 1978, p. 103).

While Vygotsky's ideas have had little direct impact on North American psychology and education, his ideas have had indirect influence, first through his student, Luria, and most recently through the Israeli psychologist, Feuerstein (1979). Feuerstein's approach to assessment and programming for mentally retarded children, the Learning Potential Assessment Device, borrows directly from Vygotsky's concept of the zone of proximal development. However, Feuerstein expands the ideas derived from Vygotsky and Luria in ways that may have particular relevance for part of the relation between play materials and social-cognitive development.

According to Feuerstein (1979), many of the cognitive impairments manifest in children do not emerge from poor genetic endownment or organic deficiencies. Rather, they emerge because of insufficient or mediated learning experiences.

> Mediated learning experience ... is defined as the interactional processes between the developing human organism and an experienced, intentioned adult who, by interposing himself between the child and the external sources of stimulation, "mediates" the world to the child by framing, selecting, focusing, and feeding back environmental experiences in such a way as to produce in him appropriate learning sets and habits ... Mediated learning, as opposed to direct exposure learning, does not depend on chance confrontation with objects but on the impact of the adult's intervention in making the child focus on and/or manipulate them...Over and above the specific contents the child might obtain by means of mediation is an attitude toward thinking and problem solving that is actively and efficiently involved in organizing the world of stimuli impinging on the individual from both internal and external sources. (pp. 71-72)

Feuerstein (1979) does not speak directly concerning the availability and use of play materials for young children. However, part of providing sufficient mediated learning experiences for children generally entails careful selection and guided use of physical objects-more clearly dealt with in Feuerstein's suggestions concerning curricula for mentally retarded children.

Theories of Instrinsic Motivation

Both Vygotsky (1978) and Feuerstein (1979) recognized the importance of children's motivation in the learning process. For Vygotsky, in particular, objects have a compelling quality for young children. The notion of a compelling quality in objects is more fully articulated in theories of intrinsic motivation. Bruner (1972, 1973) has argued that among humans there are three instrinsic motives: curiosity, competence (mastery), and affiliation. The first two have rather straightforward applications to the relation between toys and social-cognitive development. The connection with affiliation is more indirect.

Berlyne (1960, 1965) contends that stimulus properties such as novelty, surprise, complexity, and incongruity can produce conflict and, thereby, increase arousal. In essence objects and situations that manifest these properties induce exploratory behavior. They impel a person to seek information in order to reduce felt uncertainty. Gottfried (1984), in her recent review of literature that treats the application of motivation research on the relation between play materials and early development, argues that there

> is ample evidence, from infancy through early childhood, that children attend more to stimuli with collative properties than to familiar stimuli. These stimulus properties have included novelty, complexity, and incongruity…It has also been found that toys characterized by novelty (Mendel, 1965) and complexity (Ellis, 1984; McCall, 1974) are preferred, or played with more, by children. (p.4)

She goes on to conclude that play materials with these collative properties "increase arousal and therefore create curiosity, enhance attention, facilitate cognitive processing, and maintain persistence" (pp. 4-5).

The second intrinsic motive that has a direct bearing on the relationship between the availability of toys and children's social-cognitive development is mastery (i.e., the desire to experience effectance for its own sake). A feeling of effectance results when a person engages in challenging experiences (Harter, 1978). According to Gottfried (1984), "A central theme pervading the mastery view of intrinsic motivation is the concept that the child experiences him/herself as a causal agent of outcomes in the environment" (p. 7). The perception of oneself as having the power to control outcomes results in an immediate sense of pleasure and a longer term sense of self-worth. An association between mastery motivation and early cognitive development has also been demonstrated by Yarrow and his colleagues (Yarrow, MacTurk, et al., 1984; Yarrow, McQuiston, et al., 1983; Yarrow, Morgan, Jennings, Harmon, & Gaiter, 1982).

There is also a growing body of evidence which suggests that mastery motivation is facilitated by the availability of a stimulating, responsive environment. For example, Yarrow et al. (1982) found that responsive feedback from toys was significantly related to persistence in play behaviors in 6-month-old infants. Belsky, Garduquc, and Hrncir (1984) also found that the highest spontaneous level of free play among 12- to 18-month-old infants was related to the availability of a responsive home environment. From her review of the mastery motivation literature, Gottfried (1984) concluded, "Responsivity of play materials appears to be a consistent finding related to mastery motivation in play from infancy through childhood" (p.11). In sum, mastery motivation, with its concomitant positive effects on social and cognitive development, appears to be facilitated by objects and experiences that provide challenge and permit control.

The third intrinsic motive that appears connected to the relation between toys and social-cognitive development is affiliation, the inherent desire of humans to interact with other humans. That connection is perhaps best understood in the context of play.

Play and Social-Cognitive Development

The function of toys in social play contexts can be seen in the cross-systems model of Mueller and his colleagues (Mueller, 1979; Mueller & Brenner, 1977; Mueller & Rich, 1976; Mueller & Vandell, 1979). Their observational studies of toddler peer groups emphasizes the importance of toys and other play objects in the social structure. According to Mueller (1979), emerging social structure among toddler peer groups

> does not depend on peer-related skills; instead it relies on the toddler's attachment to toys and skill with toys. From the start, toddlers find themselves coming together because they share skills for things like opening the jack-in-the-box or sliding down the slide. (p. 174).

The research of Mueller and his colleagues revealed that play materials function as a contextual basis of toddler social interaction. In fact, up to the age of 2 years, 83% of all social interactions involved physical objects. Toddlers "are drawn into contact by the reciprocal interest in physical things. They initiate each other's toy play and gradually learn to control each other and not only the toy" (Mueller, 1979, p. 188).

Mueller (1979) summarized the research by reference to the cross-systems model of early social development, which posits that both a cognitive structure and a social structure are operative in social development. Cognitive growth is seen as evolving from structured social interactions. "The interactions change the child, and after several children have changed in similar ways, new forms of social structure are created; these in turn foster further cognitive change" (p. 15).

In sum, part of the connection between play materials and social-cognitive development may be their joint relation to social interaction (with both peers and adults). Playthings and other physical objects form the basis for purposive encounters which themselves involve learning, but which also lead to further development in both cognitive and social domains. Within the context of play, toys may lead to the development of physical and social skills together with imaginative reconstruction of ideas and social relations.

Bretherton (1984) has attempted to link symbolic play to social-cognitive development using the framework of script theory. Script theory maintains that young children organize information in terms of "scripts" or "stories" rather than in terms of concepts arranged hierarchically from greater to lesser inclusiveness. Script theory represents a significant evolutionary step from traditional Piegetian theory. It gives a more central role to figurative representation in cognitive development; and it more clearly links cognitive and social development. Script theory postulates that at the most basic level, representation in young children is organized in terms of event schemata that are skeletal frameworks of everyday events. Bretherton (1984) states,

> These frameworks are figurative in that they represent spatio-temporo-causal links among agents, recipients, and objects and are in this sense isomorphic with reality. They are constructed and revised in the course of repeated experiences with similar events, but they in turn guide understanding of such events. (p. 5)

Evidence suggests that these scripts or event schemata may constitute first-order organization from which other cognitive structures or processes (such as taxonomic hierarchies, roles, and problem-solving strategies) are then derived (Nelson, 1981).

The importance of toys and other play materials to event representation is clearly presented by Bretherton (1984):

> Pretending simulates and transforms routine events from family life, story books, and television. However, the ability to represent these scripts ... does not emerge fully fledged. With development, there is a marked increase in the number of roles and the order and coherence of action reproduced ... accompanied by a decreasing reliance on veridical props ... Role, action, and object representation are here treated as separate dimensions of pretend play even though, at the simplest level, they are not completely dissociable. An action always requires an agent and frequently an object ... Role and action representation are initially affected by the availability of realistic props. Later, objects can be mentally transformed into other objects and imaginary props can be

> created through miming or language. (p. 8)

For infants the value of objects in creating scripts is considerable. Their first efforts at pretending appear to require prototypical physical objects (e.g., dolls, utensils, telephones, cars). Very gradually the need for realistic objects to support pretense lessens. However, Fenson and Ramsey's (1981) observational research shows that children rarely engage in empty-handed miming prior to the middle of the third year of life. Bretherton (1984) concludes that the presence of realistic objects

> seems to provide perceptual-tactile-spatial support for the performance of the first miniscripts like sleeping or eating. Without such support, 12-month-olds are unlikely to engage in pretending at all. Later in the second year, children begin to substitute one object for another. (p. 19)

With advancing age, the ability to substitute objects increases.

Bretherton (1984) offered one final comment concerning the role of objects such as toys in social-cognitive development in pretend play:

> Although play with nonveridical objects and miming become more common with age, realistic objects continue to play an important role. In a study of collaborative pretending, Garvey and Berndt (1977) found that the presence of a realistic prop often led to the instantiation of a related script (their term is action scheme). (p. 22)

Dunn (1984), in her studies of toddlers from the United Kingdom, has carefully examined play as an arena for social-cognitive development. She found that parental involvement change both the nature and duration of time children spent in play activities:

> The data from each of the studies suggests that the mothers' involvement was frequently didactic in nature: the mothers used the context of joint pretend play to explore the concepts of size and shape, to encourage classificatory skills, and especially to discuss the function and appropriate use of objects. (p. 8)

Beyond their role as teachers, mothers also tended to use play settings as situations in which to discuss inner feelings and states with the child. Dunn (1984) concluded that a joint pretend play between mother and child offers an opportunity for a variety of social learning experiences, and that it provides a context in which mothers' speech is not only specifically didactic but is rich in those features of extension and acknowledgement that studies of language acquisition have emphasized as potentially valuable. (p. 13)

Summary and Conclusions

In sum, the literature linking the use of play materials and children's social-cognitive development is very sketchy. It provides only general clues regarding the relationship. The dearth of information notwithstanding, the following conclusions and functional-sequential model are offered concerning the relationship. They are offered for their heuristic value in generating research that may more fully delineate the relationship.

Summary Propositions

1. If given the opportunity, young children tend to spend a considerable amount of time viewing and interacting with toys and other objects.
2. The availability of a variety of responsive toys is related to social-cognitive development throughout early childhood.
3. The association between play materials and development is partially a function of parental education and socioeconomic status, but is not solely a reflection of these influences.
4. The relationship between toys and development is bidirectional. More competent children tend to seek out a greater variety

of appropriate play objects; appropriate play objects assist development.

5. Intrinsic motives of curiosity and mastery impel a child to explore and manipulate interesting toys and objects, thus providing an arena for learning.
6. Children's interest in toys leads them to social encounters with peers and adults; these are rich in cognitive and social learning opportunities.
7. Play materials sometimes act as catalysts for adult-child interactions (particularly mediated learning experiences) that help shape and support social-cognitive development.
8. Cognitive development in very young children is highly dependent on direct encounters with objects (including toys).
9. Toys and other realistic objects become useful hooks for the construction of spatio-temporo-causal scripts that characterize the infancy and preschool period.
10. As children become capable of representational thinking, objects are often used as pivots through which children transfer meaning from real objects in pretend play.
11. Toys sometimes serve as catalysts for imaginative play. They can serve to carry the meaning of the play situation to full realization. They may also help provide a link between learning derived from the imaginative world of play and the more concrete settings of the real world.

Functional-Sequential Model

The schematic found in Figure 1 depicts a set of functional-sequential relationships linking the use of toys to social-cognitive development. It does not represent a causal chain. Rather, it is designed to show a variety of ways in which

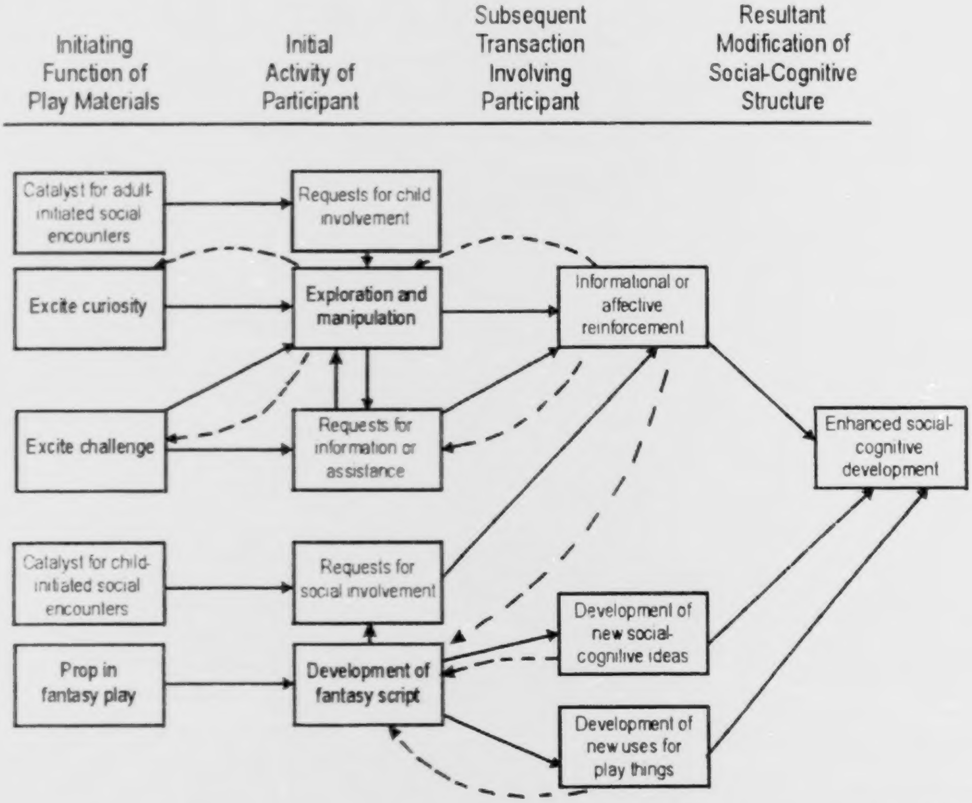
Initiating Function of Play Materials
Initial Activity of Participant
Subsequent Transaction Involving Participant
Resultant Modification of Social-Cognitive Structure
Catalyst for adult-initiated social encounters
Requests for child involvement
Excite curiosity
Exploration and manipulation
Informational or affective reinforcement
Excite challenge
Requests for information or assistance
Enhanced social-cognitive development
Catalyst for child-initiated social encounters
Requests for social involvement
Development of new social-cognitive ideas
Prop in fantasy play
Development of fantasy script
Development of new uses for play things

Figure 1. Interrelated functional-sequential tranactions involving play materials and social-cognitive development.

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play materials may serve as the beginning point in a sequence of actions that result in enhanced social-cognitive development. It is an heuristic model. No assumption is made that the sequence of events occurs exactly as depicted in all instances or that there are not other patterns of relationships linking toys to development. However, the model offers a potentially useful framework from which to plan research on play materials and to organize certain parent education activities.

In closing, two caveats are offered. First, current knowledge of both normal and delayed development indicates that it is a complex, multiply determined process. Thus, predictions about the role of play materials for specific individuals are subject to a high degree of uncertainty. Second, the purpose of this article was to discuss ways that play materials might serve to enhance social-cognitive development. While it is assumed that toys generally have an impact on development that ranges from neutral to positive, it is almost certain that their impact is occasionally negative. They can, for_example, cause frustration when too difficult to operate; they can_distract or interfere with a_more productive learning process, they can be the occasion of negative social encounters; and they can limit the use of imagination. In the long run, if a model relating play materials to development is to be maximally useful, it will have to include potentially negative as well as positive sequences.

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Infant-Toddler Intervention
7(3), 201-214

Comparison of Assessment Results Between a Formal Standardized Measure and a Play-Based Format

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With the passage of Public Law 99-457 in 1986 came a new call for the assessment and treatment of infants and toddlers with special needs. Therefore, a search for the most appropriate and effective means of intervention has evolved. In this search, the informal transdisciplinary play-based assessment model has been identified and viewed possibly as a less threatening means of gathering information about the whole child necessary for providing appropriate services. This study compares a natural, criterion-referenced play-based assessment of language to a more formal, norm-referenced standardized measure. Four subjects with a language delay were evaluated in an attempt to assess the benefits of a play-based model in the assessment process in providing an accurate analysis of a child's language capabilities. Results indicated that the play-based assessment produced higher performance scores the majority of the time. The play-based model also provided a broader picture of the child's emerging skills which are helpful in planning goals and objectives for intervention. These results warrant further research on the validity and reliability of the play-based approach in language assessment in comparison to standardized tests.

In providing services to at-risk or handicapped infants and toddlers, assessment is a primary concern. The goal is to elicit behaviors that are most representative of an individual child, so that appropriate initial treatment goals may be established. The question then becomes; the appropriate method of assessment. What measures can elicit the most typical skills and behaviors from a child in the most efficient way possible?

In assessing older children, traditional standardized tests have been independently used. Results derived from these form the basis for child placement and the delivery of services. As services have expanded to include infants and toddlers, areas of development have been identified that traditional measures have not targeted. Therefore, a need for further assessment tools appropriate for younger populations has emerged.

Currently, two types of assessments for infants and toddlers are available. The first are traditional formal assessment tools. They provide standardized results that may be helpful in gaining funding from federal and state governments as well as independent insurance agencies. Various states require these norm-referenced standardized results in their guidelines.

The second type of assessment incorporates a child's natural environment and parental participation with a play-based component. Although standardized scores are not derived, developmental levels are identified. These criterion-referenced results can also be a basis for the implementation of services to infants and toddlers.

Even though two types of measurement tools are offered for infant-toddler assessment, a conflict still remains. Which assessment method is most appropriate in eliciting typical behaviors from infants and toddlers that will aid in the establishment of intervention and provide appropriate initiation of treatment goals and objectives? This study compares a traditional standard measurement for assessment to a more natural play-based format.

Review of Literature

Public Law 99-457

With the passage of Public Law 99-457 (P.L.: 99-457) in October of 1986, came important

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changes in the educational processes of young handicapped children. Among those changes are the following key components:

Extended Services

Optional early intervention services were extended to all handicapped and medically or environmentally at-risk infants and toddlers, ages birth through 2 years, and their families. This includes all children who need early intervention to aid their development of physical, cognitive, speech and language, psychosocial, and/or self-help skills (Katz, 1989). In addition, mandatory services ensured all handicapped children 3 to 5 years of age receive special education programs and related services (Raver, 1991).

Multidisciplinary Approach

Throughout the intervention process, a comprehensive, coordinated interagency approach is required (Gilkerson & Hilliard, 1987). This entails members of each discipline gathering and providing services for a child as a team. The assessment and treatment procedures are a collaboration among the disciplines involved, so that intervention serves the whole child, not his or her individual behaviors and skills. Often discipline boundaries are crossed to ensure complete, comprehensive services. Disciplines involved may include professionals from special education, speech-language pathology, audiology, occupational therapy, physical therapy, psychology, counseling, and other health professions (Raver, 1991).

Qualified Providers

Any service provided must be administered by an individual who is most qualified to work with children who are handicapped or at-risk. Each need that a child has must be addressed by a professional who is trained to utilize appropriate methods and procedures in that specific area (Campbell, 1991).

Individualized Family Service Plan (IFSP)

An IFSP is required for all services provided to an eligible child. The services must be written into the IFSP and reviewed every 6 months. This plan focuses on the family and home environment, including parents as full partners and decision makers. It empowers the family, making them an integral part of intervention (Education of the Handicapped Act Amendments of 1986).

In view of the changes implemented by P.L. 99-457, the assessment process for handicapped children ages birth to 3 years is the focus of this overview discussion.

Assessment Approaches

As previously stated, P.L. 99-457 mandates a comprehensive, coordinated interagency approach to the assessment process. This includes the multidisciplinary approach, but is not limited to it. The interdisciplinary and transdisciplinary approaches also fall within the given boundaries (Fusilier, 1995).

The multidisciplinary, interdisciplinary, and transdisciplinary approaches all focus on a child's needs and assume responsibility for the diagnosis and treatment of each child. Each discipline provides consultation, but the results may or may not be shared among disciplines. Parents are included in the process in varying degrees of participation. 'Me overall goal of all three approaches is to provide adequate services to meet the needs of a child in every area of development (Fusilier, 1995).

Although these three approaches strive to accomplish the same goal, each service delivery model is separate and unique. Fine lines draw the differences in these models. In the multidisciplinary and interdisciplinary approaches, the team members from separate disciplines provide their own assessments, with the difference being in the service plan. Although each member of a multidisciplinary team develops separate plans for services and works independently in implementing plans, the interdisciplinary team member shares his or her separate plan with other team members, and once a team consensus is made, implements the plan independently. Therefore, the multidisciplinary approach is more parallel in its service delivery model and the interdisciplinary approach is more cooperative in service delivery (Fusilier, 1995).

On the other hand, the transdisciplinary approach differs in both the assessment and treatment domains. In this approach, the assessment is conducted comprehensively, including all the team members as well as the family. The treatment process is handled in much the same way. Team members and the family develop the integrated plan and the appointed service provider implements the plan with the family. Therefore, this service delivery is an integrative model, with information exchanged across discipline boundaries and with the family. Discipline role boundaries are not as defined, allowing professionals to cross disciplines in implementing services (Fusifier, 1995). Therefore, fewer team members can directly work with the child, reducing the stress levels for the child being evaluated and his or her family (Katz, 1989).

Looking at the assessment process independently from all other areas of intervention, the strengths and weaknesses of each model are considered.

In the multidisciplinary model, all areas of a child's development are assessed and parents are given the opportunity to meet with the individual team members (Woodruff & McGonigel, 1988). However, this approach does not promote the whole child view. Evaluations are unintegrated, noncollaborative reports of separate observations from the different disciplines, which allows for reduplication of results and conflicting views among team members. In addition, direct parental involvement in the assessment is not promoted. Parents meet with individual team members after the assessment is completed (Woodruff & McGonigel, 1988).

In the interdisciplinary model, the child is viewed as a whole, incorporating every area of need in the assessment. Even though the assessments are administered separtately, team members consult with each other throughout the assessment process. This may increase time demands for the entire process, slowing down the outcome of the results but-communication remains open across disciplines. Parental involvement is encouraged, but not a necessary component in assessment. Role release between disciplines is absent (Raver, 1991).

The child is also viewed as a whole in the transdisciplinary model. Parents are actively involved in the process, identifying typical and atypical behaviors and making decisions that affect services rendered. They are viewed as team members who provide valuable information about the needs of the child and the family, as well as strengths on which to focus (Katz, 1989). Only one assessment at one time is needed; thus, all team members, including parents, are present. Therefore, the same observation is evaluated by each discipline. Frequent meetings are held to re-evaluate results (Woodruff & McGonigel, 1988). Problems with this model include scheduling, with it sometimes being difficult to find a mutually agreeable time for every team member to conveniently meet. In addition, the child might have an off day during observation, with evaluations of that one observation not accurate and/or representative of the child (Raver, 1991; Linder, 1993).

All three models strive to serve each individual child through the interaction of disciplines. Coordinated services work together in developing the best service plan possible by addressing the needs of the child and family. However, only the transdisciplinary approach utilizes parent participation to its fullest potential, which results in optimal outcomes for the child.

Parental Involvement

Multiple environmental settings and various information sources, including parents, should be used to get the most accurate results during assessment (Sheehan & Sites, 1989), and assessments are only accurate when a child demonstrates skills that are reflective of his or her optimal ability (Greenspan, Meisels et al., 1995). Therefore, parents are important members of the assessment team, being vital in gaining those accurate results. This family-centered emphasis makes a critical difference in the assessment process, according to P.L. 99-457 (Katz, 1989).

Parents play a vital role in the exchange of information throughout the assessment process. They provide descriptions of the child's current level of functioning as well as his or her developmental history (Greenspan et al., 1995). Through interaction with parents, a child feels comfortable and secure, eliciting his or her most typical behaviors and optimal skills. Thus, parental participation is important (Greenspan et al., 1995).

Although parents may be important in supplying information about their child, doubts about their expertise weaken their credibility. Parents are not qualified to accurately assess their child's development. They have neither the experience nor the training to provide such skilled specialized services. In addition to this lack of professional ability, parents often display a naturally occurring bias for their child that is based on a pride factor. This bias may actually hinder their ability to provide accurate information about the behavior and skills of their child. (Dale, Bates, Reznick, & Morisset, 1989).

Many studies have focused on the validity of parental report in assessment. In their study of child language, Dale et al. (1989) compared 20-month-old children's assessment results from parental reports with those of standardized measures. Three sample populations were included in the study: New England; Seattle divided into groups of full-term, high at-risk, and preterm infants; and a Seattle sample of precocious children. The parents of each group were given a vocabulary check-list as part of the *Early Language Inventory* (now referred to as the *MacArthur Communicative Development Inventory* [Fenson et al., 1993]) to complete. Results gathered were compared to the language subscores of the *Bayley Scales of Infant Development* (Bayley, 1969), as well as scores derived from the "Mental Developmental Index" of that measure. The comparisons resulted in significant correlations that were consistant. This supports the usefulness and worth of involving parental report in the assessment process.

Miller, Sedey, and Miolo (1995) also studied the validity of parental report in assessing the language abilities of young children. Subjects in this study included 44 children with Down syndrome and 46 typically developing children. Comparisons of parental report from the vocabulary checklist in the *MacArthur Communicative Development Inventory* "Words and Sentences" were made with observations of language by a certified speech-language pathologist and the expressive language subscore of *the Bayley Scales of Infant Development*. Results again indicated significant correlations between parental report and validation measures.

The transdisciplinary play-based approach assessment incorporates the vital element of parental report and participation into its model. A good example of such an assessment tool is the *Rossetti Infant -Toddler Language Scale* (Rossetti, 1990). Parental report is included in the assessment tool. The information obtained from the parents is considered as equally important as the observed behaviors displayed spontaneously through play and/or directly elicited by the examiner (Rosetti, 1991b). Rosetti states that "no one source of information is more valuable than another." Information and data may be gathered form formal and informal methods, parental report, medical personnel, and other individuals who have interacted frequently with the child (Rosetti, 1991a).

Parents play a critical role in the assessment process. They provide information about their child's development that cannot be gathered from other sources. This parental involvement forms a key element in the transdisciplinary play-based assessment.

Transdisciplinary Play-Based Assessment

New trends in the assessment of infants and toddlers include play and arena assessment (Linder, 1993), both implemented in a naturalistic environment (Fewell, 1991) that is representative of a true transdisciplinary play-based approach. This model applies functional methods to the assessment process, encouraging a natural, less demanding performance from a child in evaluating his or her behaviors (Fewell, 1991; Linder, 1993). Results obtained are criterion-referenced, which measures a child's skills and behaviors in terms of absolute levels of mastery instead of comparing them to a norm group. Here, emphasis is placed on assessing those specific skills and behaviors that have been mastered (McNiece, 1995). Such transdisciplinary models for infant-toddler assessment are viewed as more efficient for this age group, whereas older children are frequently assessed using the multidisciplinary or interdisciplinary approaches (McGonigel & Garland, 1988).

Wolery and Dyk (1984) compared the transdisciplinary arena assessment to the interdisciplinary assessment in terms of effectiveness, efficiency, and affective variables. Twenty- eight families with children aged 0-5 years who were handicapped and who received both types of assessment participated in this study, as well as seven staff members (3 special educators, 1 psychologist, 1 physical therapist, 1 occupational therapist, and 1 speech-language pathologist). Each participant was asked to fill out a questionnaire evaluating the two approaches. The parent questionnaire had 54 questions that addressed the assessment and intervention process as well as overall satisfaction with the services. The staff questionnaire included 94 questions that addressed the effectiveness, efficiency, and development of the assessment process and intervention procedures.

Results of the parent questionnaire indicated that the majority of parents viewed the transdisciplinary arena assessment model as better than the interdisciplinary model. Effectively, the arena approach was thought to be more thorough and to provide a clearer picture of the child's true abilities. The arena model was also less time consuming for the parents. Affectively, the arena model was more comfortable and inviting to the parents. These results were derived from 16 returned questionnaires out of the 28 total (Wolery & Dyk, 1984).

Six of the 7 staff members completed and returned their questionnaires, which had, in general, the same results as the parent questionnaire. The arena approach was preferred in most areas over the traditional interdisciplinary approach. In terms of effectiveness and team functioning, the arena approach was judged superior. Greater parental involvement was facilitated and more positive team interactions occurred with less miscommunication and greater agreement on team issues in the arena format. In terms of efficiency and effectiveness, the staff members viewed the two approaches as about equal. Even though they rated both approaches equally in these areas, the majority stated that they preferred to use the arena assessment in intervention. Overall, the results of this study suggested the superiority of the transdisciplinary arena assessment model (Wolery & Dyk, 1984).

Fewell and Glick (1993) presented a case study that compared assessments of a child's developmental skills through play to those measured through traditional standard methods that are more structured to suggest that play is an appropriate measure for the assessment of a child's developmental areas. A 28-month-old male was the subject. His history revealed that he was born prematurely with many medical complications at birth, which automatically placed him at-risk for developmental delays. After receiving early intervention services through a state shelter and center-based program, he no longer qualified for services for the handicapped but was eligible for services for developmentally at-risk children. He was then enrolled in a full-time classroom and mainstreamed with typically developing toddlers. At that time, assessments of his behavioral skills were administered, first through standardized testing, then through observation of a videotaped play session with his playmates, both indoors and outdoors.

Results indicated inconsistencies of scores between standard assessments and observations of play. Although some scores reflected identical age-level results, others differed by as much as 6 months. Higher scores were garnered through standard measures in cognition and receptive language. On the other hand, the play assessment reported higher scores in the areas of fine and gross motor and social-emotional skills.

In expressive language, the results were equal. Therefore, assessment results derived from play provide a needed source of information and a helpful supplement to standardized measures when determining a child's accurate optimal developmental skills (Fewell & Glick, 1993).

The transdisciplinary play-based assessment combines play with a natural environment to elicit functional behaviors from a child. With the addition of parental participation, this model evokes typical behaviors that are more representative of a child. Compared to a structured standardized measure where results are normed to a specific population, the transdisciplinary play-based assessment is ideal in determining the appropriate level of infant-toddler development.

Formal Standardized measures

One of the major differences between standardized tests and transdisciplinary play based assessments is the way in which the scores are measured. Play-based assessments produce criterion-referenced results that measure the levels of absolute mastery, as previously stated; whereas standardized tests yield norm-referenced results. These results compare an individual's performance to those of the norm group, a specific population chosen as the norm. The emphasis here is not on an individual's mastery level. Rather, the individual's standing in relation to a norm group is of primary importance (McNiece, 1995).

Such formal structured testing is often viewed as an inappropriate measure when used as the basis of a diagnosis. It only provides approximations of a child's true abilities and skills, resulting in inaccurate results that misrepresent the child. Naturalistic measures are much more useful (Greenspan et al., 1995). They provide a comfortable environment and atmosphere in which a child can feel secure and at home, displaying his or her typical behaviors and skills. Caregivers are key components in providing that naturalistic environment, as previously stated. A child should never be separated from his or her caregivers/parents during assessment and introduced to a complete stranger who expects the best demonstration of the child's abilities (Greenspan et al., 1995). Formal standardized measures remove the child from his or her natural environment and secure surroundings without including parents in the assessment process.

Nevertheless, norm-referenced, standardized tests provide many advantages that criterion-referenced tests do not offer. Primarily, formal standardized measures provide reliable data that ultimately benefits the credibility of the results (Hux, Morris-Friehe, & Sanger, 1993). This reliability reflects the objectivity of the assessment tool, another major advantage. There is no room for human error or inconsistencies of results (Skinner, 1994). As a result of the reliability of test results, professional credibility may be increased, due to improved delivery of services, still another advantage (Champley & Andrews, 1993). Standardized testing also reduces the occurrence of false-negative and false-positive responses (Champley & Andrews, 1993), enhancing again the reliability of results. Finally, the administration of standardized tests and scoring of results is less burdensome than other assessments and are performed with relative ease.

Wilson, Blackmon, Hall, & Elcholtz (1991) surveyed speech-language pathologists in the California school districts to determine assessment methods used in evaluating language of children 4-9 years of age. Results indicated the formal standardized test instruments were employed very often, in many instances in combination with informal methods. However, the use of formal standardized assessments were not implemented by preference, but only of necessity. The California Department of Education required results from either two or more standardized tests or one standardized test in addition to a language sample to fund a student for language remediation services. This requirement limited the clinicians' selection of appropriate assessment batteries. If speech-language pathologists were given the opportunity to choose a language assessment tool of their choice without the hindrance of guidelines for child placement or time restraints for diagnostics, they would rely less on standardized measures and more an their own expertise and judgement. In this scenario, language samples would provide a good basis for language intervention. Even though informal assessment methods, such as language sampling are preferred by many speech-language pathologists in the schools, others continue to rely on norm-referenced tests as the primary source of information. Language samples are only used as a supplement for planning intervention goals and objectives. Reasons for placing language sampling in such a secondary position include the excessive amount of time and effort needed to elicit a truly representative sample of a child's communicative abilities. Furthermore, once the sample is obtained, additional time and skilled expertise is needed to properly analyze the data collected. Lastly, the collection and elicitation of the language sample is inconsistent among speech-language pathologists and other professionals. This decreases the chance for the reliability of data (Hux et al., 1993). Such disadvantages of informal measures make standardized testing even more appealing.

Standardized tests frequently used in the speech and language assessment of infants and toddlers include the *Sequenced Inventory of Communicative Development, Revised* (Hedrick, Prather & Tobin, 1984), the *Receptive Expressive Emergent Language Scale* (Bzoch & League, 1978), and the *Preschool Language Scale-3* (PLS-3) (Zimmerman, Steiner, & Pond, 1992). From these tests, the PLS-3 is a popular assessment tool among many speech-language pathologists. It is often used as a measure from which norm-referenced, standardized scores are obtained; thus, it is used as an assessment tool within this study.

The PLS-3 was standardized with children ages 2 weeks through 6 years, 11 months. It can be used to test children whose chronological age falls within the given age range or older children who are functioning developmentally at that level. Guidelines for administration are given to ensure the validity and reliability of test results. Included in these guidelines are instructions for the test environment and caregiver involvement. The PLS-3 suggests a quiet, comfortable room with adequate light during testing. A completely bare room is unnecessary; however, minimal distractions are ideal, so that the child's attention is not averted. In addition, little to no parent involvement is advised. Parents may be present to comfort the child, especially if under 3 years of age. However, parents are instructed never to intervene in testing or to prompt their child's response. If the parent is essential in eliciting a response, he or she is carefully instructed on the specific procedures required (Zimmerman, et al., 1992).

Even though standardized assessment tools such as the PLS-3 are effective in testing the developmental behaviors of a child and may determine reliable data, the accuracy of those test results are in question as compared to play-based assessments. We must remember that the goal of the assessment process is to elicit the most typical behaviors from a child. The most typical behaviors of a child may not be accessible in an unfamiliar environment, without interaction with his or her caregivers. Although results from standardized tests may be most helpful in receiving funding of services, more recently, the focus has turned to more natural methods of eliciting behaviors from children (Fewell, 1991).

Summary

When looking at infant-toddler assessment, the most important element to keep in mind is the accuracy of test results. If the behaviors displayed are not representative of a child, results are misinterpreted and services rendered may not be adequate to meet the child's specific needs. Therefore, the primary goal of the assessment process must be to elicit typical skills and behaviors from a child in the most efficient way possible. From these results, needs can be identified and appropriate intervention planned.

In review, many assessment approaches and tools have been identified and discussed. Each has strengths and weaknesses for the assessment of infants and toddlers. Our goal is to find the assessment method that produces the best, most accurate responses from a child, thus allowing appropriate intervention planning.

The transdisciplinary play-based assessment appears to be the superior model for infant-toddler assessment; however, several questions warrant further research. In this study, the *Rossetti Infant-Toddler Language Scale*, a transdisciplinary play-based assessment tool, and the PLS-3 a formal standardized assessment tool, are compared. The following question will then be answered: is there a significant difference between the two assessment tools? If the results are, similar, then standardized measures may be preferred because of time efficiency in administration and scoring. However, if the *Rossetti Infant-Toddler Language Scale* yields better results, then greater attention should be drawn to intervention placement and planning as well as funding issues in terms of nonstandardized assessment methods.

Methods

Subjects

Four children, 1 female and 3 males, were subjects. Ages ranged from 1 year; 10 months to 2 years; 11 months. Each child was receiving outpatient speech-language services at St. Francis Children's Hospital in Tulsa, OK. Although every subject was treated for a language delay, records revealed diverse medical histories.

Subject #1, a 2-year; 11-month-old male, was the product of a full-term pregnancy. Prior to delivery, the mother acquired a high grade fever 30 minutes before delivery that lasted 2 hours. Two hours after birth, the subject had a seizure with a recurring episode in the neonatal intensive care unit (NICU). Tests reported that he had sustained two strokes approximately 24 to 48 hours before birth. A computerized axial tomography (CAT) scan indicated that 66% of the left hemisphere and 25% of the right parietal lobe were affected. Possible causal factors included clots from the placenta. No further seizures were reported.

Subject #2 was a 2-year; 6-month-old male who was carried full term. No remarkable medical problems were reported throughout the pregnancy nor during or after birth. The subject had been diagnosed with ocular apraxia; however, visual skills continued to improve. The mother reported a delay in expressive language, which was behind receptive language ability and skills. Gesture, vocalizations, word approximations, and pantomime were the primary modes of communication. His diagnosis was a developmental language delay.

A 1-year; 10-month-old female (Subject #3) was the product of a healthy, full-term pregnancy. At that time, reports indicated a typically developing infant. At 10 months of age, the subject developed meningitis in addition to hydrocephalus and intraventricular hemorrhages. As a result, a shunt was placed during hospitalization to relieve pressure and swelling.

Subject #4, a 2-year; 2-month-old male, was born prematurely at 27 weeks gestation, weighing 2 pounds, 2 ounces. During pregnancy, the mother developed hypertension elevated liver enzymes and lowered platelets (HELLP) syndrome, which resulted in severe toxemia causing the subject to be prematurely removed from his mother's womb. After birth, the subject was on a ventilator for 3-4 weeks and had respiratory distress as well as bronchopulmonary dysplasia (BPD). The subject required 81 days of hospitalization. Cerebral palsy was his resulting diagnosis.

Parental consent for participation of the subjects in the study was obtained from the primary caregivers.

Procedure

Two complete assessment tools, the *Preschool Language Scale*-3 (PLS-3) (Zimmerman et al., 1992) and the *Rossetti Infant-Toddler Language Scale* (Rossetti, 1990), were administered individually to each subject by a graduate student in speech-language pathology. A speech-language pathologist certified by the American Speech-Language-Hearing Association (ASHA) supervised the evaluation sessions with a maximum of one caregiver present. The amount of time allotted to finish both tests on a single subject was two consecutive 45-minute sessions, one per week (See Table 1 for specific times required). Both tests were given in a quiet environment with minimal ambient noise.

Initially, the *Rosetti Infant-Toddler Language Scale* (Rossetti, 1990) was administered during free play with the subject. Parental participation was encouraged throughout the session to assist in eliciting specific skills and abilities, as well as to report typical skills and abilities that the child possessed but did not perform during testing. A parent questionnaire was distributed to caregivers/parents to provide more information about their child's development and current level of ability. They were instructed to complete and return the questionnaire before the following therapy session.

Next, the PLS-3 (Zimmerman et al., 1992) was administered in the second consecutive weekly session directly following the completion of the previous test, the Rosetti. Throughout the PLS-3, the test administration guidelines were followed precisely. Only one repetition was permitted for each test item, questions and phrases could not be worded or expanded, and caregivers were not allowed to intervene in the testing or prompt responses from their child. A worksheet providing family information and suggestions was given to the caregiver to complete while testing was conducted.

Table 1. Time Allotments

Subject #1:	1 75 min. session
Subject #2:	1 45 min. session
Subject #3:	2 45 min. session
Subject #4:	2 45 min. session

Results

Comparison of the two assessment tools for all four subjects revealed that the result of the age-equivalent standard scores in the expressive and receptive language domains are similar in some cases but not consistent with the receptive and expressive language scores obtained from the play-based assessment. Similarities and differences of scores from both assessment tools were identified in a review of results for each individual subject in both language domains.

For subject #1, the age equivalent standardized scores were 3-6 months higher in the expressive language domain that in free-play activities; however, receptive language scores presented higher in the play-based assessment by 1-4 months. This reflected an inconsistency in test results across domains. The remaining subjects, #2, #3, and #4, had more consistent test results in expressive and receptive language. In every case, the play-based assessment provided higher performance scores in both language domains, with the exception of one expressive language score, which was equal to the age-equivalent standard score. These scores between assessment tools within domains throughout the subjects ranged from 1 month to as much as 5 months (See Figures 1 and 2 and Tables 2 and 3).

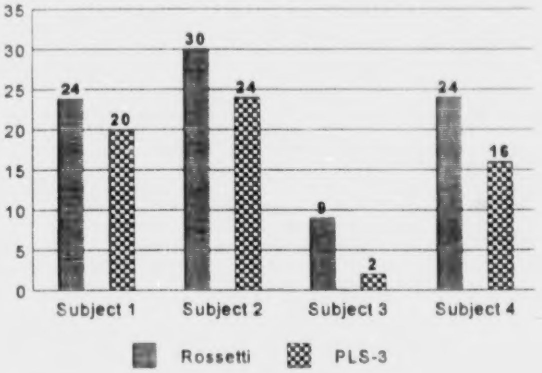

Figure 1. Scores by months of receptive language

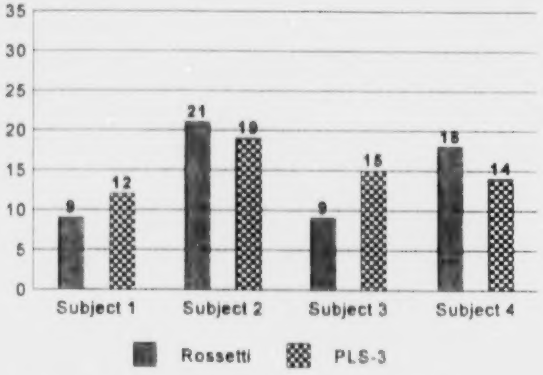

Figure 2. Scores by months of expressive language

Table 2. Scores by Months of Receptive Language

	Rosetti	PLS-3
Subject #1:	21-24	20
Subject #2:	27-30	24
Subject #3:	06-09	02
Subject #4:	21-24	16

Table 3. Scores by Months of Expressive Language

	Rossetti	**PLS-3**
Subject #1:	06-09	12
Subject #2:	18-21	19
Subject #3:	06-09	15
Subject #4:	15-18	14

Discussion

This study compared the results of two assessment tools, one play-based and one standardized to determine the importance and relevancy of a play-based assessment, if any. Based on the results of the study, a play-based assessment of expressive and receptive language skills provides information on the child's highest level of functioning that is useful for planning goals and objectives for intervention. In this study, the majority of the play-based assessment results produced higher performance levels in both expressive and receptive language. Therefore, the optimal level of skill development may have been identified. This may be because parents, who are most familiar with a child, were involved in the assessment process to help identify the child's current level of functioning in both domains. Parental report concerning their child's daily skills and abilities were viewed with equal importance as those observed by the tester during the play-based assessment. The standardized test prohibited parental involvement. As a result, further research may be warranted to determine the validity of parental input in evaluating their child's skills in language.

In addition, the play-based assessment identified emerging skins not yet mastered, which is beneficial in planning intervention goals and objectives. The standardized test in this study did not appear to be as detailed and thorough in identifying skills to target in therapy.

That test results were varied between play-based and standardized assessment tools poses some critical questions: Which assessment approach is most representative of a child's most typical skills and abilities? Which approach will provide the most accurate picture of a child's true language? Are higher scores derived from the play-based assessment tool as accurate and reliable as the standardized scores? If so, then a play-based assessment is as appropriate, if not more so (due to the benefits of garnering more detailed intervention information) than standardized test batteries in providing a basis for intervention. These questions need to be addressed in further research on play-based assessment.

Another point to consider is that guidelines for standardized tests administered by certified speech-language pathologists are not always strictly followed. Speech-language pathologists have reported that during standardized testing, the administration rules are slightly bent to ensure the elicitation of the highest level of test results from a child. Examples of some guideline modifications include allowing parental participation in testing, doing more than one repetition of test questions, and rewording of test items. Each modification is determined for each individual child to prompt his or her most typical performance. The goal is to elicit the most accurate display of skills and abilities. The reliability of these reports should be addressed through research for further clarification of standardized test administration by speech-language pathologists. The following questions could then be answered: Is this information true and accurate? How often do these modifications occur and to what extent?

Because of such reported modifications in standardized test administration, parental views about the standardized test and play-based assessment appeared basically the same. In this study, no differences were noted by the caregivers, no remarks made, until they were asked to remove themselves from the standardized test procedures. Only then did caregivers seem a little puzzled and confused about the assessment process. It was apparent that they were not accustomed to being uninvolved in their child's evaluations. Comfort levels decreased slightly when a parent could not fully participate in the assessment.

Based on reports from certified speech-language pathologists and observed reactions of the parents in this study, it seems as if standardized tests are currently being administered in a more naturalistic, play-based fashion. Therefore, formal standardized tests are not being used as they were intended. If this is true, play-based assessments are already being used to evaluate the language of infants and toddlers, only they are labeled as standardized tests and they have standard scores. Thus, when determining eligibility for children with speech and language disabilities where standard scores are required for the qualification of services, results from a play-based assessment should qualify a child for speech and language services.

In view of the results of the language performance scores in this study as well as the beneficial information addressed, more emphasis should be placed on information gathered from informal play-based assessments in addition to or in place of the results formed from standardized testing. Professionals from various agencies should recognize the value of play-based assessments and consider them as appropriate as standardized test results. Much more can be gained with nothing lost-except the time necessary to complete a thorough, complete evaluation.

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The American Journal of Occupational Therapy
45(10), 882-888

Play Deprivation in Children with Physical Disabilities: The Role of the Occupational Therapist in Preventing Secondary Disability

Cheryl Missiuna, Nancy Pollock

Key Words: handicapped • pediatric occupational therapy • play and playthings (leisure)

Self-initiated free play experiences are vital for the normal growth and development of all children. In this paper, children with physical disabilities who are deprived of normal play opportunities are viewed as having a second disability that hinders their potential for independent behavior and performance. Physical, social, personal, and environmental barriers that may limit the play experiences of children with physical disabilities are delineated. Studies of the interactions of these children during play are discussed, and a case is made for the promotion of active, free play in the home, the school, and the community. As facilitators of this process, occupational therapists must consider a variety of factors, including the unique capabilities of the child, the influence of parent-child and peer relationships, the role of other caregiving adults the adaptation of toys and materials; and the impact of the environment and setting.

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Occupational therapists are unique in their emphasis on productive activity. A primary productive activity for young children is play (Bundy, 1989). In therapy, we frequently use play activities to achieve treatment objectives such as fine motor skill development, postural control, and concept development. This widely accepted use of toys and playful activity can be contrasted with another less evident function of play: the value of free play for its own sake. Rast (1986) noted, "Play and therapy almost appear to be mutually exclusive. A child's play is an intrinsically motivating activity done voluntarily and for its own sake; therapy proceeds according to the therapist's plan to achieve definite treatment objectives" (p. 30). If we consider play to be the primary productive activity for children, then the development of play skills becomes, in itself, an important goal for therapeutic intervention. Play acts as an antecedent for work and adult recreation and also serves to develop competence. We need to concern ourselves with play skills and also with the child's playfulness and motivation to engage in play.

In this paper, literature is used to demonstrate the purpose and benefit of free play experiences and to outline some of the barriers to free play that may be encountered by children with physical disabilities. The role of occupational therapists working with parents in preventing play deprivation and secondary disability is explored.

What is Play?

Play is a complex, multifaceted behavior that is relatively easy to observe and describe but difficult to define theoretically (Rubin, Fein, & Vandenberg, 1983). Two characteristics that would be considered by most to be essential to the construct of play are that it be intrinsically motivated and that it be pleasurable (Ellis, 1973; Lindquist, Mack, & Parham, 1982; Mack, Lindquist, & Parham, 1982). In an occupational behavior framework, play is considered to be the primary activity of the child, a prerequisite to competence in occupational roles later in life (Reilly,1974). Play has an exploratory component that is engaged in for its own sake and a competency component that results from an inner drive to master the environment (Reilly, 1974). Work and play are viewed along a developmental continuum, with play continuing to serve an adaptive function in adulthood (Kielhofner & Barris, 1984; Matsutsuyu, 1971). Sheridan (1975) elaborated on this work-play distinction by defining *play* as "eager engagement in pleasurable, physical or mental effort to obtain emotional satisfaction" (p. 5). *Work*, in contrast, is defined as "voluntary engagement in disciplined physical or mental effort to obtain material benefit" (p. 5).

The benefits of play are well-established (Ayres, 1981; Ellis, 1973; Erikson, 1963; Garvey, 1977; Gralewicz, 1973; Kielhofner & Barris, 1984; McHale & Olley, 1982; Piaget, 1951, 1952; Reilly, 1974; Vandenberg & Kielhofner, 1982). During play, children have the opportunity to discover what effect they can have on objects and people in their environment and to develop and test social and occupational roles. As children move around and explore their world, they receive information through their senses, gain knowledge about the nature and properties of objects, and develop rules about their own location in time and space (Robinson, 1977). The skills that are developed during play permit children to interact with and respond to the demands of their environment (Anderson, Hinojosa, & Strauch, 1987). This, in turn, leads to perceptual, conceptual, intellectual, and language development and, it has been argued, to the eventual integration of cognitive abilities (Levitt, 1975; Weininger, 1979, 1980, 1988; Weininger & Fitzgerald, 1988).

Occupational therapists working within sensory integrative, neurodevelopmental, occupational behavior, and developmental perspectives have recognized the sensorimotor, social, and constructive benefits of play and have justified its wide use in therapy as a treatment modality (Anderson et al., 1987). It is important for us, as therapists, to examine whether or not the benefits that may be attributed to the playful use of activity can be equated to the definition of play as a pleasurable activity that is emotionally satisfying. The distinction between the two forms of play can be highlighted by referring to the latter form as *free play*. In contrast to planned therapy sessions that are designed to produce specific responses through play, free play is spontaneous, intrinsically motivated, and self-regulated and requires the expressive personal involvement of the child (Calder, 1980; Garvey, 1977; Gunn, 1975; Yawkey, Dank, & Glossenger, 1986).

Primary and Secondary Forms of Play Deprivation

The designation, *children with physical disabilities, is* used in this paper to refer to children with sensory impairments, multiple handicaps, or limitations in voluntary movement or mobility. The impact of any of these disabilities can range from mild to severe in the degree to which the disability interferes with the child's ability to function independently. A child with mild cerebral palsy may have poor hand function, limiting his or her ability to manipulate a toy as desired; a child with a more severe impairment may be unable even to communicate his or her interest in a toy. Regardless of the individual circumstances, Mogford (1977) has proposed that the ability of children with physical disabilities to "explore, interact with, and master their environment is impaired with a consequent distortion or deprivation of normal childhood experiences" (p. 171).

The deprivation described by Mogford can be considered from two perspectives. First, a physical disability often implies an absence of, or deficiency in, sensory and motor information being received by the child. A child will inevitably be deprived of the play experiences that cannot be made available to him or her due to the disabling condition. For example, a child with a visual impairment will not be able to experience directly the effect of play with lights or colors, nor will a child with a hearing impairment have the opportunity to play with voices and musical sounds. Alternative forms of play can be substituted, but this primary form of deprivation will remain unchanged.

Second, the occupational therapist is concerned with the secondary disabilities that may arise as an indirect result of play deprivation. Children with physical disabilities are often more dependent on their caregivers and other people than are nondisabled children (Rubin et al., 1983). Brown and Gordon (1987), in a study of the activity patterns of children with physical disabilities, found that disabled children spent more time in self-care and passive activities in their own homes than did nondisabled children. The child who is unable to experience normal childhood play because of a physical disability may encounter secondary social, emotional, and psychological disabilities. Examples of this form of play deprivation are children with visual impairments who are not permitted to climb monkey bars because they might fall, children with hearing impairments who are not allowed to play outside because they might not hear a car, and children in wheelchairs who are unable to cross the street to get to a park.

Free play provides a forum for children to explore their own capacities, to experiment with objects, to make decisions, to understand cause-and-effect relationships, to learn, to persist, and to understand consequences. This type of play also fosters creativity and allows a child to develop social skills when the play involves peers. Cotton (1984) suggested that, in addition to developing competence through play, the child also learns to cope with anxiety, frustration, and failure.

If children with physical disabilities are deprived of the opportunity to regularly engage in free play, it seems plausible that particular types of secondary disabilities are likely to result. Increased dependence on others, decreased motivation, lack of assertiveness, poorly developed social skills in unstructured situations, and lowered self-esteem are a few of the difficulties that may be experienced by children with disabilities (Clarke, Riach, & Cheyne, 1977/1982; Levitt & Cohen, 1977; Mogford, 1977; Philip & Duckworth, 1982). These secondary disabilities have an impact not only on the child's play and development, but also on later functioning in the school setting, the community, and the workplace. It is in the prevention of secondary disabilities that the role of the occupational therapist becomes important.

Barriers to Free Play

Play deprivation, primary and secondary, may occur as a result of many different forms of barriers. For children with physical disabilities, the areas that have been addressed most frequently in the literature are limitations imposed by caregivers, physical and personal limitations of the child, environmental barriers, and social barriers.

Limitations Imposed by Caregivers

Children need the freedom to initiate and engage actively in activities, the chance to make decisions and take risks, and the opportunity to master their physical selves or to accomplish a task they have chosen (Diamond, 1981). Well-meaning parents and teachers frequently overprotect children who have disabilities and may not permit their participation in normal activities (Calder, 1980; Hewett, Newson, & Newson, 1970; Philip & Duckworth, 1982; Williams & Matesi, 1988). Whether due to fear of injury, pity, compassion, or lack of knowledge about a child's abilities, adults may intervene too quickly and may unnecessarily limit the child's opportunity to play (Diamond, 1981; Levitt, 1975). In addition, concern for the child's physical development and progress may lead caregivers to fail to appreciate his or her need for play, with the result that free time may be used for therapy or for catching up on schoolwork (Calder, 1980; Mogford, 1977).

Physical and Personal Limitations of the Child

The natural exploration of the environment observed even in infancy in nondisabled children may not be possible for the child with a physical disability. Lack of mobility, limited communication, difficulty with reach and grasp, and impaired sensory responses may all interfere with the child's ability to play with toys or household objects. Children with physical disabilities may not be provided with chances to engage in nonstructured forms of play, such as launching an assault on the kitchen cupboards, bouncing on the bed, roughhousing, and participating actively in the neighborhood, at the park, and on the playground (Levitt, 1975; Russell, 1978). Csikszentmihalyi (1975) stressed the importance of matching a person's skills to the challenges of the environment. In the case of the child with a physical disability, environmental challenges often exceed the child's skills, leading to anxiety and frustration.

In addition to the apparent physical and sensory limitations, a number of authors have suggested that there may be factors within the child that limit participation in play. Limited intrinsic motivation (Levitt & Cohen, 1977; Mogford, 1977), lack of drive and decreased concentration (Salomon, 1963; Sheridan, 1975), and withdrawal due to lack of skill or frustration (Calder, 1980) have all been proposed as problems that may be inherent in the disabled child. It is not possible to state with certainty whether these problems originate within the child or arise secondarily due to a lack of opportunity for participation in self-initiated play activities.

Environmental Barriers

Barriers imposed by the physical environment (e.g., steps, narrow doorways) may severely limit the disabled child's opportunities for fire play. These barriers may be present in the home as well as in the community (e.g., schools, recreational facilities, and playgrounds). The physical structure of toys, materials, and equipment may limit children's ability to express themselves and to explore objects (Rubin et al., 1983). Changes within the child's home environment may have been made to suit the child's individual needs; however, in the authors' experience, these modifications are rarely extended to the broader community environment. For the most part, buildings and playgrounds have been constructed to meet the needs of the young person without physical disabilities. A safe environment that allows opportunity for freedom of movement and that is filled with familiar play materials is considered to be optimal for free play (Knox, 1989). How often is this type of environment available for the child with physical disabilities?

Social Barriers

Interaction with peers. Most normal free-play experiences center around interaction with peers. Parten (1932), in the now-familiar hierarchy of social interaction during play, described the increasingly complex stages of play ranging from parallel play to cooperation among players to achieve a common goal. Through these increasingly sophisticated interactions, the child learns societal norms and rules of behavior, is given the chance to experiment with different roles (e.g., leader, organizer), and models the social behaviors of other children. Children with physical disabilities are often limited in their interactions with other players due to both physical limitations and exclusion by their peer group. With decreased opportunities for interaction during the early years, the child with a disability may have a limited repertoire of social skills, which further increases his or her isolation. To illustrate this point, consider the presence of a child with physical disabilities in a mainstreamed kindergarten program. The child may not know how to initiate play with another child or how to join a group of children already playing at an activity center. It is no wonder that studies have repeatedly demonstrated that children with physical disabilities have poorly developed social skills (Clarke et al., 1977/1982; Philip & Duckworth, 1982).

Interaction with parents. The lack of playfulness present in many parental interactions is another potential area of social deprivation during play (Kogan, Tyler, & Turner, 1974; Oster, 1984). Therapists may ask parents to become the child's teacher-therapist in the home environment. Although consistency and carryover of treatment ideas and approaches are beneficial to achieve therapy objectives, the question of the cost to the parent-child relationship must be raised. The interaction of a parent functioning as a therapist can be very different from normal parent-child interaction, and professionals have recently begun to question the effect of this interaction on the social development of the child with a disability (Rogers, 1988). It has further been proposed that the role of home therapist may produce an emotional conflict for the nurturing, accepting parent (Foster, Berger, & McLean, 1981). If parents are asked to follow a regimen established by a therapist, then their unique role and interaction with the child may be diminished (Kaiser & Hayden, 1984).

A number of studies performed in recent years have addressed this issue through an examination of the play of mothers with children who have physical disabilities. In contrast to nondisabled children, results suggest that mothers of disabled children perceive play and teaching situations as similar (Oster, 1984); show more negative affect and perceive the play situation as unrewarding (Kogan, 1980; Kogan et al., 1974); and are more directive and controlling (Brooks-Gunn & Lewis, 1982a, 1982b; Crawley & Spiker, 1983; Cunningham & Barkley, 1979; Hanzlik, 1989; Hanzlik & Stevenson, 1986; Oster, 1984). Many parents have expressed concern about the "one good hour" that they may have with their child: Their desire to simply cuddle and play with the child is rapidly extinguished when they recall the necessity to perform a home program (Kaiser, 1982). Similarly, several adults with cerebral palsy reported to Kibele (1989) that therapy had a negative effect on their relationships with their mothers. The demands of home programs limited their leisure time and, in some cases, led to the impression that they were disappointing their parents, particularly when skill development did not improve. It is essential for a parent to have positive interactions with his or her child, yet it is also important for the child's development to be stimulated whenever possible. Free play, not disguised therapy, may achieve similar objectives with less stress on the family.

Overcoming Barriers to Play: The Role of the Occupational Therapist

Occupational therapists may be in an ideal position to develop and maximize the free play opportunities of the child with physical disabilities in many settings. As professionals who are concerned with the child's development in the areas of self-care productivity, and leisure, occupational therapists have the opportunity to work with the child in the home, in a treatment facility, or in a wide variety of community settings. Awareness of the barriers that the child frequently encounters and an understanding of the child's capabilities may facilitate the consultative process.

Assessment

Naturalistic observation and appraisal of a child's developmental play level is as essential to an occupational therapy assessment as evaluation of other activities of daily living. The play history, the types of play engaged in (e.g., active, exploratory, imitative, constructive, dramatic), the stage of play (e.g., solitary, independent, parallel associative), and the developmental progression of object play (e.g., functional, relational, symbolic, combinatory) may all receive consideration. (Good reviews of these areas can be found in Behnke & Fetkovich, 1984; Florey, 1981; Kielhofner & Barris, 1984; Sheridan, 1975; and Sparling, Walker, & Singdahlsen, 1984.) Other important parts of a complete assessment are the frequency of play times, the variety of toys available, the physical location, and the opportunities for social interaction with peers and caregivers during these times.

Intervention

Providing opportunities for free play. Children with physical disabilities often have much less time available for play than do their nondisabled peers, in part due to the time spent in therapeutic programs (Brown & Gordon, 1987). If play is believed to be an important component of the child's fife, then time must be built in to allow for free play experiences in the classroom, the therapeutic setting, the home, and the community.

In any play situation, a child needs to have the opportunity to choose, to explore, to create, and to respond to change if the result is truly to be called free play. Consideration can be given to the play space, recognizing the child's need for both personal play space and free-ranging space in contact with other people (Stout, 1988). Whenever possible, caregiving adults can be encouraged by the therapist to let the child explore and interact independently. Numerous studies have indicated that adults working with physically disabled children tend to intervene too quickly, with the result that the children become highly dependent on this intervention during play (Federlein, 1979; Field, 1980; Field, Roseman, de Stefano, & Koewler, 1982; Levitt, 1975).

Consultation with parents. The therapist's expectations of, and recommendations to, the parent in the home environment must be thoughtfully considered. Parental participation in a child's play is not only positive but may be essential for children with more severe impairments. Many parents view this play time, however, as a time to "learn to use materials and to learn to use them correctly" (Oster, 1984, p. 156). To maximize play opportunities, parents may first need to be convinced of the importance of free play to the total health and development of the child. Understanding the educational value of play as well as the sequence of development that occurs in play may help parents view play as more than a pastime. Henderson and Bryan (1984) have suggested that parents must believe that self-direction is important and must trust their child's ability to learn from his or her own play experiences. The parent-child relationship is reciprocal, and parental expectations and beliefs will have an impact on the quality of the play. In addition, some of the apparent benefits of play-increased motivation, improved self-concept, and more active participation-may be viewed negatively by parents. For example, children who were previously satisfied with the vicarious experiences provided by television may become more demanding in their desire to have an active play life. In these instances, increasing the involvement of siblings or peers at home or in a play setting may be beneficial.

Consultation with teachers and caregivers. When therapists talk to teachers or caregivers about play and make recommendations for toys and play activities, the specific barriers that may limit the child's play in that setting must be addressed. The limitations imposed by caregivers are usually grounded in a genuine concern for the safety and welfare of the child. It is important for the therapist to acknowledge these concerns and to discuss with caregivers or teachers the extent to which their fears are realistic. Suggestions can be provided regarding the child's optimal positions for play and the extent to which he or she may need assistance. The child's capabilities, not limitations, should be stressed for two reasons: First, a child can demonstrate unique abilities and be remarkably creative when motivated to move or perform an activity, and second, a child needs to be enjoyed as a child, not as a child with a disability. Free play periods may offer this opportunity.

Integrated preschool and school settings offer ideal opportunities for peer interactions. Both the therapist and the caregiver should maximize the child's opportunities to be involved with his or her peers, without interfering with the spontaneity of these situations. Children with physical disabilities may need assistance with mobility, positioning, and access to playthings and equipment in order to allow them to participate to their maximum potential; however, dependence on the presence of an adult should be discouraged. The child may need some instructions on how to enter a play group, but this skill can also be learned from peer models. The role of the adult is to structure the environment, both physically and socially, and then allow play to happen.

Recommendations about playthings. The toys and activities that are made available for the child will influence both the type and quality of play. Sensitivity must be shown to social, emotional, physical, and educational needs and also to the interests of the child. A toy that is suitable for one child may be extremely unsuitable for another because of differences in temperament, motivation, and previous life experiences. To maximize the play experience, careful consideration must be given to the child's current developmental level. Toys of intermediate novelty are usually optimal: A toy should have an element of familiarity to the child but be sufficiently novel to induce exploration. Gradual pacing of activities will encourage the child to experiment and take risks but will ensure that the resulting information can be integrated into knowledge acquired previously. For example, familiarity with pouring water from cups into the bathtub might lead to the introduction of a funnel, a sieve, or a can with holes punched in it. The same item carried to the sandbox will produce entirely new results for the child. As a guideline for the development of intrinsic motivation, Ellis (1973) proposed that activities should be paced to the next developmental level, possess sufficient complexity to require investigation, be manipulable and responsive, and pose questions to be pondered by the child.

Advances in technology and computer applications have opened up a new world of play for even the most severely disabled child. Langley (1990) provided a thorough review of many toys that are suitable for children with physical disabilities. More traditional toys and materials, however, may still require modification by the occupational therapist (Lemire, 1988). The size, shape, weight, and consistency of materials may need to be adapted to suit the individual child (Anderson et al., 1987). A toy library may be helpful, allowing parents to borrow the more expensive electronic toys or to test adapted toys on a trial basis. Equipment modifications (e.g., an adapted playground, foot straps and back rests for a tricycle) may also serve to make an out-of-bounds activity accessible to the child. The "toys" that normal children discover in cupboards, basements, and backyards (e.g., pots and pans, insects, cardboard boxes, sticks) must not be overlooked for the child with a disability. As Diamond (1981), a physically disabled adult, pointed out, spitting 3 ft away and playing in the mud are also accomplishments for the child.

Summary

Free play has been proposed in this paper as a vitalizing element in the development of the whole child. The experiences derived from childhood play include exploration, mastery, decision making, achievement, increased motivation, and competency-qualities that will eventually help children to develop occupational roles and to become more productive members of society (Bundy, 1989). Children already restricted by physical limitations who are not given adequate opportunities to engage in free play may be acquiring secondary disabilities, including diminished motivation, imagination, and creativity; poorly developed social skills; and increased dependence. The occupational therapist may be able to prevent some of these secondary problems by enhancing free play opportunities for the child who has a physical disability.

Acknowledgments

The development of this paper was supported In part by scholarships awarded to the first author by the Easter Seal Research Institute and the Social Sciences and Humanities Research Council of Canada.

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Journal of Visual Impairment & Blindness
91(4), 401-406

Play and Concept Development in Infants and Young Children with Severe Visual Impairments: A Constructivist View

S. L. Recchia

Infants and young children who are severely visually impaired from birth show consistent delays in concept development, compared to their sighted peers. This article focuses on the impact of severe visual impairment on the development of those play skills that facilitate concept development and discusses the ways in which intervention can enhance play experiences for infants and young children with severe visual impairments.

What sighted infants master through play is based on their developmental needs. Ideally, play for children with severe visual impairments should be adaptive in the same way. Early play experience, according to theory and research in child development, sets the foundation for future exploration, manipulation of objects, and interactions with peers. The application of this knowledge to infants and young children with severe visual impairments challenges researchers, practitioners, and parents to expand their perceptions of what is considered "typical" to give meaning to children's experience and to create meaningful interventions for them (Brambring & Troster, 1994; Recchia, 1986, 1987).

The differences that have been observed in the play of young children with severe visual impairments, as compared to their sighted peers, have typically been viewed as obstructing development (Fraiberg, 1977; Recchia, 1986, 1987; Rogers, 1988; Skellenger & Hill, 1994). Children with severe visual impairments often show more significant lags or deviations in their play skills than do those with other disabilities, particularly in the areas of sensorimotor and symbolic play (Rogers, 1988; Rogers & Puchalski, 1984). Several qualitative aspects of play behavior, such as spontaneity, creativity, attention, and exploration, often are greatly reduced in their play. The resulting experiences for young children with severe visual impairments are believed to have serious implications for their later development (Skellenger & Hill, 1994; Tait, 1972b).

Construction of early concepts

Constructivists focus on the relationship between early play experience and concept development in infants and young children. They believe that intellectual development during the sensorimotor period, or what is usually the first two years of life, emerges directly from infants' understanding of the world based on what Piaget (1962) calls their "plane of action." Concrete activities within their day-to-day experience precede and make possible infants' use of intellect, thus forming the foundation for later mental development. This perspective provides insight into the differences in concept development that are often evident in older children with severe visual impairments (Warren, 1984, 1994).

Through their active engagement with objects and people, infants build conceptual understandings. What begin simply as sequences of sensorimotor activity gradually develop into internal representations. These understandings are refined and expanded as infants mature and gain experience and as they move from the sensorimotor stage to subsequent stages of cognitive development, when representation and symbolic acts take on greater significance. The ultimate result of this process is "intelligence," defined by Piaget (1962) as the child's potential for adaptation.

Divergent and alternative pathways

For many children with severe visual impairments, alternative, nonvisual methods to gain developmentally appropriate skills are not equally available during all stages of development (Brambring & Troster, 1994; Fraiberg, 1968, 1971, 1975, 1977; Kopp & Recchia, 1990; Tait, 1972a; Wills, 1970). Some stages in the development of play and interactive skills have been viewed as particularly vulnerable. Most sighted infants, for example, transition easily from appropriate early preoccupation with their own bodies into a greater interest in the environment. Infants with severe visual impairments, however, more often remain stuck at this transition point (Wills, 1970). The period of time before a child reaches for and locates a toy on sound cue alone is considered especially sensitive, and there appears to be a wide range in the age at which infants with severe visual impairments acquire this skill (Fraiberg, 1977).

Fraiberg (1968) describes a divergence in the developmental paths of children with and without visual impairments at around four months of age. At that age, fully sighted infants begin to coordinate sight, sound, and reach largely as a result of visually integrating their sensorimotor experiences. The process of accruing the information that facilitates their ability to do this, however, begins long before this point. The only indication of how well infants have integrated this information is their physical ability to use their bodies to demonstrate their knowledge. Just as this new capacity emerges from the integration of previous learning, infants' knowledge will stem from their current capacities. Thus, as developmental paths diverge, future knowledge is affected by subsequently differentiated experiences.

Implications

From a constructivist perspective, delays in active exploration or variations in concrete experiences will affect the rate at which an infant's intellectual capacity develops. The coordination of schemes, such as pairing the sight of an object with its sound or its sensation, helps make infants' understanding coherent and acts as the first step toward acquiring the object's concept. Sighted infants use vision as a primary means of integrating their sensory experiences. Infants with severe visual impairments are not able to find a ready substitute for the role of vision in this process.

For example, consider the following: By the time sighted children are ready to begin drinking from a cup, a major developmental milestone in Western culture, most have had innumerable experiences visually observing the act of drinking from various containers. As they begin to handle their own little cup, they have a sense, based on what they have seen, that this object belongs to a greater class of objects used for drinking, something that everybody seems to do. They have had the opportunity to consider a framework in which to form the concept of "cup," simply through visual observation. Much of their learning has occurred incidentally, with little effort on the part of caregivers to introduce this important concept systematically.

Because the remaining senses cannot substitute for vision, it often takes more time for children with severe visual impairments to gain adequate environmental experience on which to base their conceptual understandings (Fraiberg, 1977; Tait, 1972b). Without specific interventions designed to introduce the properties of a cup systematically, first encounters with this object have little context for meaningful interpretation. Even after children with severe visual impairments drink from a cup successfully, it may still take years before they realize that a china coffee cup, a crystal wine glass, and a plastic tumbler are all variations on the same theme, particularly if they do not have direct tactile experience with each of these.

Because young children with severe visual impairments have more limited experience than do sighted young children, they have fewer schemes to work with. Furthermore, because they live in a sighted world, some of the schemes they do develop may not be fully validated by others (Recchia, in press; Tait, 1972a). Many of their understandings may appear distorted or even dysfunctional from a sighted perspective. The following example provides a vivid illustration: A precocious 22-month-old child with congenital blindness was exploring a hard plastic ball, carefully examining its small openings, which were designed to facilitate looking and reaching inside. After several minutes she quietly said "face." The fact that this hard plastic ball with holes in it represented a human face to her seemed a bit shocking at first, yet one cannot help but be amazed at how she constructed that representation, At the same time, it would be difficult from a sighted perspective to anticipate such a concept forming or to facilitate her understanding of a face (from *her* perspective) by using such an object. The highly visual representation of the human face seems all encompassing for the sighted individual.

Challenges for early intervention

Expanding opportunities for infants and young children with severe visual impairments to engage in their environments actively and making sure that activities are interesting and meaningful from their point of view often requires some ingenuity on the part of the adults. Most parents do what comes naturally-they wait for the infant's cues before providing new experiences. But infants with severe visual impairments do not always give the cues their parents are waiting for, and the cues they do give can be subtle and difficult to read (Recchia, 1986, 1987, in press).

Because children with severe visual impairments are more dependent on language for understanding their environment, the degree to which caregivers can establish reciprocal verbal contact early on can make a significant difference in their children's eventual responsiveness. Using language to provide a running and interactive description of the child's experience may not be intuitive, however, especially for caregivers who rely on vision for much of their understanding (Recchia, in press; Tait, 1972a). Researchers have found that parents of young children with severe visual impairments tend to ask their children closed-ended questions about objects rather than provide them with enriched descriptions (Kekelis & Andersen, 1984; Moore & McConachie, 1994, 1995) and encourage more spontaneous and creative responses.

The primary characteristics of play

Although not all caregivers think of play as a primary vehicle for concept development, most would probably agree that children's play behavior encompasses two major components of that process: interaction with materials in the environment and social collaboration with others (Tait, 1972b). Both of these components have been identified as potentially challenging for young children with severe visual impairments (Rettig, 1994; Skellenger & Hill, 1994).

Wolery (1989) has identified some of the most common characteristics of play as the following: intrinsic motivation, spontaneity, active engagement, positive affect, nonliterality, flexibility, and a focus on means more than ends. Incorporating these characteristics into daily routines with infants and young children with severe visual impairments can enhance their play skills while developing a foundation for the meaningful understanding of concepts. In addition, many of the characteristics of play just listed have been identified as important to a child's social-emotional development, an area in which children with severe visual impairments are at risk for delay (Warren, 1984). The impact of an increased focus on playful interactions with very young children may thus extend well beyond cognitive interventions.

Suggestions

Intrinsic motivation. The desire to play comes from within the child-it is not merely stimulated by objects or activities in the environment. What is intrinsically motivating to a particular child may be idiosyncratic. To capitalize on it, it is important to pay close attention to what the child likes to do and how he or she likes to do it and to begin by following the child's lead in play. Attempts to expand or adapt behaviors that children are intrinsically motivated to participate in are more likely to be met with success.

Spontaneity. Children play because they want to, and their play arises from their own choices. To be able to make a choice, children need to be aware of what is available to them. By initially engaging in guided exploration of consistently available objects and activities, parents and professionals can help familiarize children with a range of possible choices. It is also important to introduce new toys and activities to choose from as they become available. Because children with severe visual impairments cannot scan their environments visually for new and exciting options, they often have no way of capitalizing on opportunities to act more spontaneously without some additional input from others. However, to encourage spontaneity, the children must be allowed to make the selection themselves.

Active engagement. Although at times it may seem easier to present activities to children with severe visual impairments, the more they are actively involved in the process of play, the more meaningful experiences become for them. Helping children become actively engaged may require longer waiting times than adults are often comfortable with at first. It is important to overcome the temptation always to entertain the child, despite the positive feedback this may engender.

Positive affect. Play involves pleasure and enjoyment. Both the process and the outcome of play should be experienced as positive. Play times should be opportunities for positive social interactions, as well as positive responses to objects and their properties.

Nonliterality. Play allows for less serious or real activities. Children must have a sense that they are free to explore the properties of objects in a variety of ways-that there is not just one prescribed way to behave with a particular set of materials. Allowing opportunities for nonliterality can be difficult when the intervention agenda focuses too heavily on teaching particular skills. It is important that young children with severe visual impairments be given ample opportunities for silly and pretend play and for sharing their pretend discoveries with others.

Flexibility. Play should involve variety in both content and context. Toys and activities can be engaged in a number of ways and across various situations. Because children with severe visual impairments need extra time and experience to understand fully the properties of many objects, it is especially important to provide opportunities for varied and expanded interactions with those objects. Again, when intervention is focused too narrowly on teaching specific object properties, opportunities for flexibility can be compromised. It is important to find a balance between providing children with the security of routine activities and encouraging them to expand their thinking.

Means more than ends. Play focuses on process more than product; ongoing engagement in the activity itself is more important than the outcome of the activity. When the goal of intervention is the attainment of a specific skill or product, the processes of engagement and discovery may become de-emphasized, changing the focus of an activity from playful to task oriented. It is through their playful, active involvement in the processes of engagement, exploration, and discovery that children do the work of constructing meaning.

Conclusion

From the beginning, infants and young children learn through their active involvement in everyday experience. By paying attention to individual infants' own ways of behaving and responding to objects and people, watching for and learning to read their often subtle cues, and gently working to bring the world to life for them by helping them coordinate associations between sensory experiences, parents and early intervention professionals can build on the infants' planes of action, ultimately affecting concept development.

Through play children gain a sense of control over their environment. They become competent in dealing with the objects that surround them, learning to do things on their own. Children who do not develop this sense of having some control over their environment tend to retreat into themselves (Recchia, in press; Tait, 1972a). Young children with severe visual impairments are at tremendous risk for this kind of behavior. Providing opportunities for exploration early on and expanding on these opportunities through enriched verbal descriptions helps infants and young children with severe visual impairments integrate their experiences in more meaningful ways.

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Journal of Visual Impairment & Blindness
1994, 421-432

The Play Behavior and Play Materials of Blind and Sighted Infants and Preschoolers

H.Tröster, A Brambring

Parents' answers to a survey of their children's play behavior revealed numerous differences between the play behavior of children who are blind and children who are sighted. The main findings were that the sighted children engaged in more complex levels of play at an earlier age than did the blind children, the blind children interacted less frequently with other children than did the sighted children, the blind children preferred tactile-auditory games and toys and rarely engaged in symbolic games.

Children's play is an important source of information for assessing children's sensorimotor, cognitive, and social-emotional development. It is also important in education and intervention because systematic instruction in play encourages children to have more environmental experiences (Quinn & Rubin, 1984; Rubin, Fein, & Vanderberg, 1983). The observation of play behavior in children who are blind provides valuable unobtrusive information on the children's specific developmental problems, and suitable systematic instruction in play promotes the children's development.

The lack of vision leads to specific differences in the play behavior of children who are blind from that of children who are sighted (for a review, see Brambring & Tröster, 1991). Thus, it has been found that, in comparison to sighted children, blind children do the following:

1. Explore their surroundings and the objects in their surroundings less often (Fraiberg, 1977; Olson, 1981, 1983; Sandler & Wills, 1965; Tröster & Brambring, 1992a, 1993; Wills, 1972).
2. As infants and preschoolers, frequently engage in solitary play that is repetitive and stereotyped (Freeman et al., 1989; Parsons, 1986; Sandler, 1963; Warren, 1984; Wills, 1972).
3. Exhibit less spontaneous play; far more than sighted children, they have to be taught how to play (Burlingham, 1961, 1967, 1972, 1975; Rothschild, 1960; Sandler, 1963; Sandler & Wills, 1965; Tait, 1972c; Wills, 1965, 1968, 1970).
4. Do not or only rarely imitate the routine activities of their caregivers (Fraiberg, 1977; Sandler & Wills, 1965).
5. Play less frequently with stuffed animals and-dolls and rarely engage in animism (Warren, 1984; Wills, 1979).
6. Play less frequently with peers and usually direct their play toward adults (Schneekloth, 1989; Tait, 1972a, 1972b; Wills, 1972).
7. Exhibit clear delays in the development of symbolic play and role play (Fraiberg & Adelson, 1973; Sandler & Wills, 1965; Tait, 1972a, 1972b; Wills, 1968,1970).
8. Engage in play that contains fewer aggressive elements (Burlingham, 1961, 1965; Fraiberg, 1968; Wills, 1970,1981).

Because information on these differences was obtained mainly from singlecase observations and there have been no comparative studies of the play behavior of blind and sighted children, empirical support for them is slight (Warren, 1984). To ameliorate this situation, the authors investigated the influence of the lack of vision on the selection of toys by and the play activities of infants and preschoolers who are blind by asking the parents of blind children and the parents of sighted children about their children's play behavior.

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METHOD

Parents were given a questionnaire (Brambring, Dobslaw, Klee, Obermann, & Tröster, 1987), designed for an age range of 6 months to 4 years in sighted children and up to 6 years in blind children, which they completed in their own homes. The questions referred to the children's current level of play; preferred toys, household articles, and natural objects; and preferred types of play activities.

Questionnaire

Level of play

For this question, the parents were asked to select one of five levels of play that most closely corresponded to their children's current level of play. The five levels were 1) body-related play (for instance, kicking feet, waving arms, and sucking fingers), 2) undifferentiated object manipulations (including shaking a rattle, scratching surfaces, and squeezing a squeaky toy), 3) relational object manipulations (such as hitting blocks together, dropping blocks into a container and taking them out, and wrapping objects in cloth and then unwrapping them), 4) functional object manipulations (for example, rolling a musical ball, using a spoon to stir in a cup, and switching a radio-audiocassette recorder on and off), and 5) symbolic play or role play (such as feeding a doll, playing mother or father, and playing at driving a car).

The structured response categories were based on Largo and Howard's (1979) hierarchical classification scheme and were constructed so that each level of play could be discriminated unequivocally. Examples were given to facilitate the ratings of parents of both blind and sighted children.

Preferred toys

In a space underneath the question, the parents wrote in their children's current preferred toys in response to the open-ended question, "What are your child's favorite toys at the present time (toys, household articles, and/or natural objects)?"

Preferred types of play activity

Again, the parents wrote in their children's current favorite activities in a space below the open-ended question, "What are your child's current favorite activities: a) playing alone, b) with siblings/other children, c) with yourselves/other adults?"

Data Collection

Parents of blind children were given questionnaires at 22 intervention centers for people who are blind or visually impaired in Germany. The centers were asked to distribute the questionnaires to parents whose children were completely blind except for light perception and who exhibited no additional severe impairments other than blindness. Parents of sighted children were surveyed as part of a study by Elisabeth Gottschalk in fulfillment of a master's degree thesis in psychology.

Construction of Categories

Preferred toys and activities were coded using two category schemes that were developed on the basis of the parents' answers to the questions; in the first scheme, objects were described according to their function for certain play activities (for example, a doll as a symbolic toy), and in the second scheme, objects were labeled by their type (such as natural materials), rather than their function. The contents of the 13 categories were selected to encompass the entire spectrum of possible toys and activities (see Brambring & Troster, 1991) and to be suitable for classifying the play behavior of both blind and sighted children.

To categorize preferred play activities, we developed a universal category scheme for the three types of play-for instance, solitary play, play with siblings or other children, and play with parents or other adults. For each of the 17 coding categories that were constructed, such as simple construction play (filling and emptying containers, drawers, and cupboards) or complex construction play (such as building with bricks, Duplos, or Legos), operational definitions were provided for classifying parents' responses.

Naturally, not all categories were equally applicable to all three aspects of play.

RESULTS

Characteristics of Samples

Blind children

Of the 104 questionnaires received from parents of blind children, 91 were deemed usable and were subjected to further analysis; the remaining 13 were dropped from the analysis because they did not fit the criteria for eligibility (with regard to visual status, other severe impairments, or age). Of the 91 children, 73 (41 boys and 32 girls) were aged 4-48 months (mean = 23.8 months) and 18 (9 boys and 9 girls) were aged 49-72 months (mean = 60.9 months)

With regard to the onset of blindness, 86.5 percent were born blind and 9.6 percent lost their sight during the first year of life; no information was available on the remaining 3.9 percent. None of the children had better than light perception; 50.8 percent were completely blind and 31.7 percent had light perception in one eye; it was not possible to determine the visual status of the remaining 17.5 percent.

The cause of blindness in the majority of the children (67.7%) was retinal detachment. Within this subgroup, 45.2 percent had retinopathy of prematurity, and the majority of them had been extremely premature (birthweight, under 1,000 grams; duration of pregnancy, fewer than 30 weeks); for children under age 2 years in this group, age was corrected for prematurity by subtracting the amount of time the infants were preterm from their calendar age. The causes of blindness in the remaining 32.3 percent were as follows: damage to the optical nerve, 12.8 percent; deformation of the 7.6 percent; damage to external parts of the eye, 6.1 percent; and various other causes, 5.8 percent.

Sighted Children

Of the 122 sighted children for whom there were questionnaires, 73 children were matched to the blind children up to age 48 months on age, gender, parents' socioeconomic status, and size of home city. Forty-one of the sighted 4-48 month olds were boys, and 32 were girls (mean age = 24.6 months). Chi-square tests confirmed that the matches were successful for all the groups, so that these individual characteristics could be assumed to be parallel.

Current Level of Play

Table I presents the mean age of the sighted and blind children as a function of level of play. Significant differences between the blind and sighted children were found on all levels of play. Age differences between the blind and sighted children widened with increasing levels (a scissor effect). With regard to mean age in individual levels of play, there was a significantly higher variance for the blind children, except on the level of functional object manipulations.

Preferred toys and activities

The agreement by two independent raters on a random sample of 20 completed questionnaires was high-90 percent on the categorization of preferred toys and 79 percent on the categorization of preferred play activities. Agreement on the classification of preferred toys was considered high with 13 categories, and agreement on the classification of play activities was considered satisfactory with 17 categories.

Significant differences were found only on play with siblings or other children; 39.7 percent of the parents of blind children versus 78.1 percent of the parents of sighted children reported that their children played with siblings or other children, χ^2 (1,N = 146) = 22.18, $p < .001$. Parents of blind children who reported one or more play activities reported a significantly lower mean number of activities with siblings or other children than did the parents of sighted children (M = 1.59 versus M=1.95), U = 620, $p < .05$.

Table 2 presents the percentages of blind and sighted children with one or more preferred toys in the various categories. The blind children more frequently chose noisemaking objects, household objects, natural objects (such as stones), and musical objects (such as a

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Table 1
Levels of play by blind and sighted children[a]

	Blind children (up to 72 months)		Sighted children (up to 48 months)		t		P
Levels of play	*M*	*SD*	*M*	*SD*	*F*	df	P
Body-related play	-	-	-	-	-	-	-
	(n = 0)		(n 0)		-		-
Undifferentiated object manipulations	15.7	7.0	8.3	1.5	2.96	41.	<.01
	(n = 34)		(n 9)		22.06		<.001
Relational object manipulations	25.6	11.2	12.6	3.0	4.19	32	<.001
	(n = 18)		(n = 14)		14.45		<.001
Functional object manipulations	39.6	13.1	24.0	10.4	4.01	34.03	<.001
	(n = 19)		(n = 18)		1.57		ns
Role play	55.2	14.4	34.5	8.3	6.57	50	<001
	(n = 20)		(n =32)		3.03		<.01

[a] *M* = mean age of the children in months, and SD = standard deviations; n = number of children for whom the corresponding level of play was reported. F ratio to test variances; I test for homogeneity or heterogeneity of variances to test mean differences among groups.

radio-cassette recorder). These preferences were statistically significant in the older blind children (aged 25-48 months), whereas in the younger blind infants (under age 25 months), the only statistically significant preference was for noise-making objects. Compared to the blind children, the sighted children played significantly more frequently with symbolic and construction toys, picture-touch books, and painting and handicraft materials (such as crayons and PlayDoh).

Solitary play

With regard to solitary play, several significant differences were found (Table 3).

1. In the older age group, the blind children explored objects more frequently than did the sighted children.
2. In both age groups, the blind children engaged in noise-making activities more frequently than did the sighted children.
3. Whereas simple construction activities were equally represented in the play repertoire of both the younger blind and sighted children, these activities were more frequently seen in the play repertoires of the older blind children.

Significantly more sighted children than blind children in both age groups engaged in complex construction play and painting and handicrafts, and significantly more sighted children in the older group engaged in simple and complex symbolic play.

Play with siblings or peers

Table 4 presents the proportion of blind and sighted children who engaged in various play activities with siblings and other children. Statistically significant differences were found for only three types of play in this category. That is, when playing with other children, the blind children more frequently listened to audiocassettes or used touch books than did the sighted children. In contrast, the sighted children engaged more frequently in complex construction play, as well as painting and

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Table 2
Preferred toys, by age group[a]

Preferred toys	Under 24 months Blind children (n = 40)	 Sighted children (n = 39)	24-48 months Blind children (n = 33)	 Sighted children (n = 34)	49-72 months Blind children (n = 18)
Noise-making objects	80.0	3.33***	45.5	2.9***	7.4
Household objects	57.5	64.1	69.7	17.6***	12.1
Natural materials	5.0	7.7	21.2	0.0**	0.0
Musical objects	7.5	0.0	15.2	0.0*	9.8
Symbolic toys	12.5	25.6	27.3	85.3***	27.6
Construction toys	7.5	38.5***	30.3	38.2	12.4
Picture books or touch books	2.5	30.8***	12.1	29.4	1.5
Painting and handicraft utensils	2.5	15.4*	3.0	23.5*	3.3
Movement toys	30.0	41.0	39.4	41.2	6.2
Cuddle objects	32.5	33.3	30.3	14.7	11.6
Stick toys and form toys	18.0	23.1	24.2	17.6	0.0

[a] Percentages of blind and sighted children with one or more favorite toys in each respective category. Multiple answers across toy categories were possible; multiple answers within one toy category were ignored. The "other' category and nonsignificant categories with less than 10 percent reports in both groups are not presented. χ^2 statistics are on frequency differences between blind and sighted children. *P < .05, **P < .01, ***P < .001.

Table 3
***Solitary play* activities, by age group.** [a]

Play activities	Under 24 months Blind children (n = 40)	 Sighted children (n = 39)	24-48 months Blind children (n = 33)	 Sighted children (n = 34)	49-72 months Blind children (n = 18)
Exploring	45.0	25.6	21.2	2.9*	0.0
Making noises	35.1	7.7**	23.7	2.9**	19.8
Simple construction play	15.0	30.8	33.3	0.0.***	6.0
Simple symbolic play	5.0	10.3	9.1	41.2**	5.0
Complex contruction play	0.0	12.3*	6.1	26.5*	7.0
Complex symbolic play	0.0	5.1	9.1	32.4**	2.0
Painting, handicrafts	0.0	15.4*	0.0	17.6**	5.4
Motor play without materials	27.5	25.6	18.2	5.9	7.4
Motor play with materials	20.0	15.4	18.2	14.7	7.4
Touch/picture books listening to stories	2.5	12.8	18.2	29.4	27.7

[a] Percentage reports for blind and sighted children on different solitary play activities. Multiple answers across categories were possible; multiple answers within one category were ignored. The "other" category and nonsignificant categories with less than 10 percent reports in both groups are not presented. χ^2 statistics are on frequency differences between blind and sighted children. **P*<.05, ***p* < .01, ****p* <.001.

handicrafts, with other children; however, only the difference with regard to painting and handicrafts was significant in both age groups.

Play with parents or other adults

Table 5 presents the proportion of blind and sighted children who engaged in various play activities with parents or other adults. Statistically significant differences were found for various types of play in this category. Thus, the older blind children and their parents cuddled together, sang and engaged in preschool play together, and produced more noises together than did the sighted children and their parents. In contrast, the sighted children in both age groups looked at picture books together with and had stories read to them by adults more frequently than did the blind children. In addition, the younger sighted children engaged in complex construction play with adults more often than did the younger blind children, and the older sighted children more frequently played sorting games or did puzzles with adults than did the older blind children.

DISCUSSION

Methodological Considerations

Since we collected data from early intervention centers throughout Germany and these centers care for nearly all children who are visually impaired and because we asked detailed control questions in the questionnaire, we consider the sample to be representative of the population of congenitally blind children with no additional severe impairments. Therefore, we could use the results to make statements about the type and variability of blind and sighted children's preferred toys and activities as a function of age and to draw conclusions about the ages at which various types of play are acquired and how these types of play develop over time.

However, we could compare only the number of blind or sighted children who preferred specific play materials and types of play, but not the frequency, duration, and quality of either play activities or the use of specific play materials. For example, there was no difference in the number of blind and sighted children who engaged in activities in the gross-motor domain, such as romping, climbing, and riding tricycles. Nevertheless, we had to assume that the two groups actually differed greatly in the frequency, duration, and quality of these activities. A comprehensive, detailed overview of the qualitative and quantitative differences in the play behavior of blind and sighted children will be possible only when these aspects are taken into account.

Furthermore, we did not test the reliability and validity of the parents' reports and hence do not know whether the parents reported all their children's actual play behaviors or only those that were dominant and easy to observe and whether they reported the less frequent behaviors less reliably. However, since this criticism is applicable to the parents of both the sighted children and the blind children, the comparison of the two types of children still seems valid, despite the weaknesses in the type of assessment instrument we used Although a multiple-choice questionnaire might have reduced this problem, it did not seem appropriate at the time because we had insufficient information on the typical play materials and activities of blind children.

Group-specific preferences

A comparison of the preferred toys and play activities of the two types of children indicates that there are clear differences in these areas as a function of the presence or lack of sight. Thus, blind children show the expected blindness-specific constraints on the use of play materials that require visual-manual skills. When playing alone, they prefer toys and materials that have a distinctive tactile or auditory effect. Their typical play behavior during solitary play is the tactile exploration of the articles of daily living and their surroundings (such as spoons, walls, and furniture), and they are interested in making noises. In contrast, sighted children prefer visual-manual activities, such as looking at picture books and engaging in handicrafts or painting.

Table 4

Play activities with siblings or other sighted children by age group[a]

	Under 24 months		24-48 months		48-72 months
Play activities	Blind children (n=40)	Sighted children (n=39)	Blind children (n=33)	Sighted children (n=34)	Blind children (n=18)
Touch or picture Books, listening to Stories	21.4	3.6*	26.7	13.8*	7.5
Painting, handicrafts	0.0	21.4*	6.7	31.0*	3.4
Complex construction Play	0.0	17.9*	6.7	20.7	15.0
Motor play without materials	42.9	39.3	40.0	20.7	3.4
Motor play with Materials	7.1	21.4	20.0	31.0	8.4
Complex symbolic Play	0.0	0.0	20.0	34.5	31.7
Cuddling	21.4	14.3	6.7	0.0	2.5
Making noises	21.4	14.3	13.3	3.4	0.0

[a] Percentage reports for blind and sighted children on different play activities with other children. Multiple answers across categories were possible; multiple answers within one category were dropped. The "other" category and nonsignificant categories with less than 10 percent reports in both groups are not presented. χ^2 statistics are on frequency differences between blind and sighted children. *P < .05, **P < .01, ***P < .001.

Table 5

Play Activities with parents or other adults, by age group.[a]

	Under 24 months		24-48 months		49-72 months
Play activities	Blind children (n = 40)	Sighted children (n = 39)	Blind children (n = 33)	Sighted children (n = 34)	Blind children (n = 18)
Cuddling	50.0	33.3	18.2	2.9*	8.1
Singing, preschool play	22.5	7.7	39.4	11.8**	7.9
Making noises	17.5	5.1	12.1	0.0*	0.0
Touch books or picture books, listening to stories	10.0	35.9**	18.2	47.1**	13.8
Complex construction play	0.0	12.8*	9.1	5.9	5.4
Sorting games	2.5	0.0	0.0	14.7*	8.4
Motor play without materials	52.5	43.6	36.4	20.6	13.6
Motor play with materials	15.0	25.6	21.2	8.8	7.9
Simple construction play	7.5	2.6	15.2	2.9	0.0

[a] Percentage reports for blind and sighted children on different play activities with parents or other adults. Multiple answers across categories were possible; multiple answers within one category were ignored. The "other" category and nonsignificant categories with less than 10 percent reports in both groups are not presented. χ^2 statistics are on frequency differences between blind and sighted children. *P < .05, **P < .01, ***p < .001.

The greater frequency of structured play between blind children and their parents, which is typical of kindergarten, indicates that these parents make more effort to intervene purposefully in their children's development than do the parents of sighted children. Furthermore, since cuddling seems to remain an important activity, even with older blind children aged 4 or 5, it seems that the parents of blind children express their affection more physically than do the parents of sighted children because they cannot use visual contact and facial expression to do so.

Far fewer blind children than sighted children engage in interactive play with other children, even though the results revealed no significant differences in the number of siblings the children had or the children's attendance at nursery school. Again, this difference is probably related to the function of vision in childhood play behavior: Sighted children may find it difficult to adjust to the ability levels of blind children, whereas-blind children may not be able to cope with the demands of play with sighted children. This finding may indicate that there are threats to the development of social skills in blind children because playing with peers is considered to be crucial to social development (SuttonSmith, 1976).

LEVEL OF PLAY

Assessing the level of play with set categories shows that there are clear differences between the play of sighted children and blind children. That is, differences in the acquisition of play activities by the two groups of children become larger as the levels of play become more difficult, and blind children acquire more complex forms of functional and symbolic play at a far later age than do their sighted peers.

Is it possible to interpret the results of this study as an expression of the level of cognitive and social development of blind children, as Fein (1978), Piaget (1952), or Sutton-Smith (1976) did with sighted children? Such an interpretation may be supported by the fact that blindness, especially in the early years of life, leads to severe restrictions on having natural experiences in the world (Ferrell, 1986; Lowenfeld, 1973; Warren, 1984). These restrictions reduce the potential for cognitive and social learning in blind infants and preschoolers and could be reflected in developmental delays in play behavior.

However, these differences could also be explained by blind children's impaired access to play materials and their manual and coordinative difficulties in dealing with material objects. This interpretation applies particularly to functional play because traditional functional toys require a high level of fine-motor skills that young blind children cannot be assumed to have. Thus, the results cannot explain whether observed delays in blind children's acquisition of complex functional play are due to the lack of cognitive ability or to finemotor difficulties.

With regard to symbolic play, one must ask whether traditional symbolic toys are symbolic in any way for blind children, whose symbolic play may be expressed in sounds or language, rather than with material objects. Even if this interpretation is not accepted, differences in the acquisition of symbolic play cannot be interpreted as indicating a developmental delay in "representational intelligence" (Fraiberg, 1977, p. 282). It is far more likely that for blind children, traditional symbolic toys, such as automobiles and dolls, do not represent realistic, scaled-down versions of real objects or persons in tactile or auditory terms. Since sighted children also use nonsimilar substitutes for their symbolic play only at a later stage of development (Vondra & Belsky, 1991), it is not surprising that blind children exhibit symbolic play with traditional symbolic toys during the late preschool stage. Hence, the delayed acquisition of symbolic play is not an unequivocal indication of delayed cognitive or social development in blind children.

Given the present level of knowledge, we cannot explain whether the differences in the blind children's and sighted children's acquisition of individual types of play behavior indicate true differences in development or whether these differences can be explained by differences in the way that the two groups of children play with traditional play materials. The development of toys that do not place the already mentioned demands on blind children may eventually provide an answer to this question (see Tröster & Brambring, 1992b).

IMPLICATIONS FOR EARLY INTERVENTION

Several authors (see, for example, Quinn & Rubin, 1984; Rubin et al., 1983) have stated that children's cognitive and social-emotional skills can be encouraged through suitably structured play. For blind children, such interventions would have to be based on specific developmental conditions (Warren, 1984, 1989), not on standard data on sighted children, because blind children's acquisition of individual types of play behavior, as our results demonstrate, take a different course. For example, blind children do not seem to acquire more complex forms of functional play before late preschool age because of their manual and coordinative difficulties.

A major objective of early intervention in this area is to find appropriate play materials. For functional play with objects, it is necessary to develop play materials that elicit an interesting tactile or auditory effect when manipulated, such as building blocks that play ascending notes on a musical scale when they are placed on top of each other in the correct order. Only specifically designed play materials that allow blind children to have manual control over the cause and effect of their actions and motivate the children by the auditory or tactile effect they elicit will stimulate the children to play with objects.

Intervention that is designed to improve blind children's cognitive skills should use more auditory games. For example, asking a blind child to continue a series of tones (loud, soft, loud, . . .) trains the child in cognitive principles that sighted children normally practice with forms or colors.

With regard to promoting symbolic play in blind children, it may be possible to develop symbolic toys that have a tactile, auditory, or even olfactory similarity to real objects or persons. Nevertheless, because of the aforementioned manual and coordinative constraints on blind children when handling concrete objects, even such toys may not be sufficient. Therefore, other ways will have to be found to facilitate symbolization in blind children.

One such way to make it easier for blind children to grasp symbolization is to make the movement of the play action and reality, rather than the features of the play object, similar. For example, when a child touches a toy swing, symbolization may eventually be facilitated if the child performs the swinging movement with his or her fingers on the toy swing. Perhaps it is not the toy swing (the object), but the swinging (the movement) that may enable blind children to relate this play to the reality they have experienced.

The field knows little about the stimulation of such blindness-specific play that could help compensate for the constraints on blind children's play behavior. Therefore, much more research is needed to determine the type and quantity of encouragement that would be deemed adequate for such play.

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The study reported in this article was part of a larger research project Early Intervention and Family Counseling for Blind Children and Preschoolers or the Special Research Unit on Prevention and Intervention in Childhood and Adolescence. University of Bielefeld, funded by the Deutsche Forschungsgemeinschaft (German Research Association). The authors thank Jonathan Harrow, University of Bielefeld, for translating this article from German, Elizabeth Gottschalk, for collecting the data on the sighted children; and the early intervention centers for their cooperation.

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Early Childhood Research Quarterly
5,347-358

The Emergence of Social Play in Infancy: A Proposed Developmental Sequence of Infant-Adult Social Play

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Adults engage in social interactions with infants from the moment of birth. Many of these interactions take the form of early social play, often thought to begin when peer interaction begins. This article proposes a developmental sequence of adult-infant social play. The proposed sequence is based on, and approximately reverses, the Howes (1980) peer play scale. Support for the developmental sequence is culled from pertinent literature. The sequence is proposed as a starting point for further discussion and research.

INTRODUCTION

Infants, from the moment of birth, are engaged in social interactions with adults in their environment. Some of these interactions serve to meet the daily needs of the infant such as rocking and patting to help the infant relax before sleep. Others are more playful in nature. These playful interactions are characterized by a mutual involvement of the adult and infant. They are lighthearted in nature and have social exchange and enjoyment as their only purpose. Though social play is often thought to begin when peer play emerges, early play between caretaker and infant is a purely social activity. Only the adult and the child are involved, engaging in synchronized exchanges of smiles, sounds, and gazes. This early play can be likened to a symphony or a ballet as it is a choreographed event.

Infants appear to be immediately prepared for social interaction with adults who respond appropriately to signals from the infant (Bowlby, 1969; Trevarthen, 1974). *A* newborn looks to the mother who smiles and vocalizes in response. The infant then begins to react with the whole body and a cycle of interaction is set up, a game has begun. From early on, infants respond differently to adults than they do objects (Brazelton, Koslowsky, & Main, 1974; Trevarthen, 1974). The response of an infant to a visual stimulus reveals whether the infant is seeing a person or an object. Infants pay affective attention to people which does not occur in response to objects. Arms and legs move slowly, the face becomes alert, and the infant smiles and vocalizes.

Early social interaction has been linked to a number of important areas of development. The ties between integrative processes, emotionality, social communication, and play are strong. For example, this early mother-child play has been considered to be vital in the formation of the mother-infant relationship. If parents and infants are playful and enjoy interactions, more secure attachments between the infants and parents might result. Ainsworth, Bell, and Stayton (1974) determined that the mother's responsiveness to the signals sent by the infant during face-to-face play resulted in more secure attachment classifications at 12 months of age. Parent-infant play may help infants regulate their affects to some extent as well. As a result, children are judged to be more securely attached at 12 to 18 months (Rogers & Sawyers, 1988). Furthermore, there is evidence that children who are securely attached at this critical separation stage can more easily move on to peer play and further development of social skills. The development of self-esteem is also linked to early social interaction. Infants appear to be preadapted to expect that a caregiver will be responsive to their signals but will also permit exploration and autonomy. These early reciprocal exchanges allow affect to be communicated between adult and infant, and self-esteem starts to develop. Furthermore, if the caregiver is successful at reading early infant signals, the child is more likely to develop an internal model of oneself as a valued, self-reliant person (Bowlby, 1969).

Early adult-child play allows the infant to learn and practice the rules of social interaction. These rules, including mutual involvement, turn taking, role repetition, and nonliterality, are inherent in early mother-infant games (Bruner & Sherwood, 1976). The ability to interact with peers, which arises in the next year, may develop from the experiences in early infant-mother play rather than from those found in nonsocial forms of play (Vandell, Wilson, & Buchanan, 1980).

The capacity to play is central to the theory of development of psychological well-being proposed by Winnicott (1971). In particular, he emphasized the child's early relationship with the primary caregiver. The "holding" environment Winicott proposed occurs when a sensitive mother allows the infant the freedom to explore the environment while still protecting him or her from external pressures he or she is not yet able to deal with effectively. The earliest emotional communications occur in this holding environment and shape the future emotional life of the infant. As Nancy Curry (1986) stated "...the stage is being set and the cast is being assembled for the child's play and affective life" (p. 96).

Caruso (1988) suggested that the variety and contingent responsiveness which occur in early social interaction are key to play and learning. The variety of exploratory behaviors used by 1-year-olds is related to success and sophistication in problem solving at 1 and 2 years of age (Caruso, 1988). Additionally, several studies have found a link between early mother-child interaction and exploratory behavior. Rubenstein found that 5-month-olds with more attentive mothers used more exploratory behaviors at 6 months (cited in Caruso, 1984). High parental responsiveness is related to different types of exploration at 9 and 12 months of age as well. Furthermore, 12-month-olds whose mothers focus the infants attention on specific environmental aspects are found to be more competent in exploratory play (Belsky, Goode, & Most, 1980).

As infants mature, several developmental trends emerge. Most obviously, the infant matures biologically and new skills and competencies ensue. Infants will become able to purposefully reach and grasp, and locomotion skills will develop. Next, these skills become more elaborate and complex. Infants also acquire the ability to combine two or more resources in play. The emergence of the ability to coordinate attention toward a social partner and an object of mutual interest is regarded as an important developmental milestone. The process in which interactions develop from dyadic in nature to triadic takes much of infancy to complete (Bakeman & Adamson, 1984).

Does social play begin when peer interaction begins? My thesis is that social play actually begins in earliest infancy as one discernible form of interaction between adults and infants. Furthermore, this development of social interaction with adults proceeds in an orderly, sequential fashion much as peer social interaction does.

Howes (1980) has proposed a peer play scale that proceeds through five levels:

Level 1: Simple Parallel Play
Level 2: Parallel Play With Mutual Regard
Level 3: Simple Social Play
Level 4: Complementary/ Reciprocal Play With Mutual Awareness
Level 5: Complementary/ Reciprocal Social Play

I propose, and support through a review of the literature, that infant-adult social interaction is indeed play that proceeds through a sequence of development which approximately *reverses* the peer play scale of Howes (1980). This infant social play scale is proposed as a hierarchy that builds as the infant matures. Each level is seen as comprising part of the higher forms of social play. The child moves through these levels as he or she develops new skills, new modes of communication, and a sense of self as separate from his or her mother. The proposed adult-infant social play scale is described below.

Level 1: Complementary/Reciprocal Social Play

The infant and adult engage in purely social play with the adult as the "object." The play is complementary and reciprocal in nature as smiles, sounds, and gazes are exchanged. Each partner in play relies on the other for the play to continue.

Level 2: Complementary/Reciprocal Play With Mutual Awareness

Exchanges are still dyadic in nature, but attention now shifts to objects. The adult presents objects to the infant for interaction and the infant attends only to the object. Both participants have defined roles, but no social exchange occurs during the object play.

Level 3: Simple Social/Simple Object Play

The infant can now manipulate and initiate his or her own object play. Exploration and manipulation of objects predominates. The parent is still vital in providing constant social input but not simultaneous with object manipulations.

Level 4: Object Play With Mutual Regard

The infant has the ability to attend to both objects and adults simultaneously and is now able to enter into "conversations" with adults about objects.

Level 5: Simple Parallel Play

The infant engages in solitary object play with an adult nearby. No social interaction is needed to maintain the play. The child is able to engage in social play with peers at this point as well.

Support for this scheme is presented next by evidence culled from the literature. Age ranges proposed at each level are only approximations of when one might expect to see these social play behaviors emerging and consolidating.

LEVEL 1: COMPLEMENTARY/ RECIPROCAL SOCIAL PLAY (0-4 MONTHS)

Piaget calls the period from 1 to 4 months the time of primary circular reactions. Infants spend much time watching and practicing their own body actions. Play at this age is characterized by vocal interchanges, repetitive and rhythmical activity, and matching of facial expressions initiated by the infant. Soon after birth infants and adults exchange synchronized sounds, smiles, and gazes. Mother-infant interactions tend to have a temporal pattern. The actions of both the mother and infant are needed to maintain this regular timing (Trevarthen, 1977). During a play episode, the adult is almost constantly drawing the infant's attention and the infant smiles, coos, or moves in response. Infants do not attend to all stimuli equally. Instead infants respond to voices and eye contact and visually prefer people to objects (Brazelton et al., 1974; Caplan, 1971; Trevarthen, 1974). At this age, the infant is not able to attend to object-directed acts of the mother (Treverthen, 1977). A caregiver who interacts based on the infant's signals provides a stimulus that is closer to the type the infant prefers (Stern, 1974). The actions performed by the mother in response to the infant signals are not random but are contingent on these signals. This contingent responsiveness makes the mother an object of overwhelming interest to an infant. The infant responds and reinforces the adult behavior as well as provides the adult with feedback. Newson (1979) has stated that it is as if the infant is already fluent in a universal language of gestures involving synchronized movement of the head, eyes and brows, hands and fingers, arms and legs. Thus, a circular interaction is set up from the start. Each participant relies on the other to keep the game going and to provide appropriate feedback.

The "cough" game seen early in infancy is an example of one of the early social games. The infant coughs, often quite by accident, and the mother imitates the cough. The infant coughs again and the game has been set up. Likewise, early hand play during nursing is another example of a social game. Infants will suck in bursts and stop. During the pauses in sucking, mothers talk to their infants who often reach for the face or breast. These games involve the previously stated rules of social games including mutual involvement, alternation of turns, repetition, and nonliterality. Initially, the infant may be a passive participant in the play while the adult acts as though the child was playing. Through repetition, the infant learns that his or her actions lead to a response from the adult. Furthermore, this response is pleasurable. Thus the activity becomes truly reciprocal play.

Early communicative abilities are beginning during this first social play as well. Schaffer (1984) proposed stages in communication development that correspond to the social play stages proposed here. According to his theory, during the period from 2 to 4 months, the infant is in Stage 2 in which he or she is attentive to people and makes frequent face-to-face contact. This early, purely social play of the mother and infant prepares the way for play with objects.

LEVEL 2: COMPLEMENTARY/ RECIPROCAL PLAY WITH AWARENESS (4-8 MONTHS)

At this stage, play is still dyadic in nature but centers around objects as infants turn away from face-to-face play toward exploration (Bakeman & Adamson, 1984). Infants now become object oriented (Schaffer, 1984; Stern, 1974). Trevarthen (1977) reported a significant change in communication at 16 to 18 weeks. Infants often refuse their mothers' approaches by withdrawing their gaze and looking elsewhere. New skills are developing including reaching, grasping, and mouthing. By 3 to 4 months of age, gaze, smiling, and vocalizing are integrated in play (Curry, 1986; Stern, 1974). The way the mother presents objects to the infants initially draws the child into play with objects. Additionally, the mother's intentionality with respect to objects makes early object relationships meaningful to the infant (McCall, 1979). Passive joint engagement predominates now as both the adult and the child focus on the toy and are not aware of the actions of the other (Bakeman & Adamson, 1984; Rogers & Sawyers, 1988). A key point at this stage is that the infant is dependent on the adult to interact with the toy. For example, an infant may interact with a rattle but still needs the mother to present it and hold it for inspection.

After 5 months, there is a marked increase in outside objects being brought into the infant-mother conversation (Trevarthen, 1974). Mothers are so eager to maintain joint attention that initially they free the infant of the need to shift attention back and forth between object and parent, allowing the child to concentrate on only the object (Bakeman & Adamson, 1984).

LEVEL 3: SIMPLE SOCIAL/SIMPLE OBJECT PLAY (7-13 MONTHS)

Between 7 and 13 months of age, stimulation as a form of play by the mother decreases (Crawley & Sherrod, 1984). Parents have more trouble engaging the child in interaction so toys are used to get attention (Papousek, Papousek, & Harris, 1987). Play is divided between object exploration and ritualized games with adults. Infants are now able to manipulate objects independently but still frequently stop play to use adults as social references. Various forms of exploration of objects dominate including mouthing and simple manipulation (Belsky & Most, 1981).

Piaget calls the 8- to 12-month period the time of coordination of secondary schemes. Infants now use skills acquired earlier in new situations and combinations. Skills are now extended to object play. Before 9 months mothers tend to imitate infants' behaviors literally. After this age they match the infant's affective information but often in a different manner (Bretherton, 1988).

Curry (1986) called the time between 9 and 18 months the "practicing period." During this time, locomotive skills develop allowing the child to engage in more object play and manipulation. At this stage, the infant is incredibly curious and begins the exploration that will be the foundation of later thinking ability (White, 1985). The role of the adult in infant play is changing. They now move to the role of safe base, limit setter, and role model rather than the primary source of stimulation. Adults introduce new experiences and constantly reflect the activities and feelings of the child, mainly through language. Infants play with objects but often leave the object play to socialize with the adult. The infant looks away from the mother to bring an object into the conversation and then looks away from the object back to the mother. This may develop from early instances of looking away such as those seen during Stage 1 of social play (Trevarthen, 1977).

During this time, infants are beginning to show an interest in the play of others, and imitation of adults and peers begins to emerge in play. Parallel play with peers is emerging at this time as well.

LEVEL 4: OBJECT PLAY WITH MUTUAL REGARD (13-18 MONTHS)

When the infant reaches this level he or she is now able to attend to an object of interest and a social partner simultaneously. This ability to coordinate attention is considered to be an important developmental milestone. Interactions are now triadic in nature as objects become an important part of social interactions.

This coordinated joint play emerges from passive joint engagement and increases with age (Crawley & Sherrod, 1984; Vandell et al., 1980). Bretherton (1988) suggested that around 9 months of age a developmental spurt occurs which enables the infant to realize that one's own thoughts and feelings can be shared with another person. The period between 9 and 14 months has been called the period of the "intersubjective infant" by Bretherton and represents a time when the infant can begin to use the object as the topic of interaction with an adult. At this point, infants will show or give toys to adults. Furthermore, they try to use the objects to engage parents in interactions (Caplan & Caplan, 1971). Relational forms of play show a marked, increase at 13 1/2 months. Functional-relational play also peaks during this stage (Belsky & Most, 1981). Games with toys have developed from the early shared experiences with objects.

This ability to coordinate attention marks a pivotal change in the infant's communicative competence. The infant uses gestures or vocalizations to signal a desire to share attention and to establish the object as the topic of the conversation to follow. Schaffer's (1984) early communication theory supports this stage as well. The 8- to 16-month-old is in Stage 4 and is able to engage in interactions over objects. This level may be simultaneously occurring with peers and adults. Perhaps the ability to coordinate attention applies to all social partners.

LEVEL 5: SIMPLE PARALLEL PLAY (18-24 MONTHS)

While children are developing the ability to engage in complementary/reciprocal social play with peers, they are also developing the ability to separate themselves from their mothers and play parallel to them. During this time, children are struggling with the independence/dependence battle and are starting to see themselves as separate individuals (Caplan & Caplan, 1977; Curry, 1986).

Other important changes are occurring as well. Piaget discussed the 18- to 24-month period as the time of invention of means through mental combinations. Problem-solving skills are developing, object permanence is in place. Language now begins to become a system of communication as children move away from sensorimotor experiences. Schaffer (1984) placed the 18-month-old in Stage 5 of his communicative development sequence stating that they now develop symbolic representations and gain new social skills. By 21 months, the child is well aware that he or she influences behavior and has now become his or her own source of stimulation rather than relying on adults (McCall, 1979). Pretend play emerges during these months as well. If development has proceeded smoothly through the previous four stages of social play, this stage may occur faster and with more ease.

Winnicott (1965) suggested that the capacity to be alone is one of the most important signs of emotional maturity. The basic contribution to this capacity is the experience of being alone as a very young child in the presence of an adult, specifically the mother. Ego-relatedness arises from the relationship between the infant who is alone and the dependably present mother. Being alone but in the presence of each other is important to both members of the dyad. This important ability to be "alone" emerges during this stage.

Again, the role of the adult in play changes. Toddler learning depends in part on the freedom a child is given to explore the environment. There is now a shift from adult as participant to adult as audience (Curry, 1986). Adults now provide the opportunity for new experiences while allowing the toddler to lead the play.

Rubenstein and Howes (1976) suggested that the peer is an important social object at 18 months. In their study of infants 17 to 20 months old, they looked at infant-mother interaction with and without a peer present. When both the mother and the peer were in the room, the children attended more to the peer than the mother. There was also less solitary play observed with a peer present than without. Rubenstein and Howes proposed that toddlers relate to peers because they share common play interests that mothers are less likely to share. Increased demands for attention from the mother at this age are often considered to be the child's way of dealing with the separation conflict. These same authors suggest that this increase in bids may simply represent an increased readiness for social interaction during play and a preference to share objects and play with another person. This concept fits nicely with the social play theory proposed here. As children have developed the ability to coordinate object play and social interaction they are now comfortable with this skill and anxious to use it in daily activities much as they use a newly developed skill such as walking.

In contrast to Rubenstein and Howes (1976), Turkheimer, Bakeman, and Adamson (1989) reported the play of 12-, 15-, and 18-month-old infants to be more complex with mothers than with peers. This developmental sequence does not suggest that play is more complex with peers but does suggest that children at this age are simply more interested in peers when available. Although adult-infant play may not occur as frequently, it still provides the scaffolding for peer play and thus may very well be more complex than play. with the peer.

Howes (1987) stated that complementary and reciprocal play with peers emerges during the early toddler period of 13 to 24 months and increases in frequency with age. While infants are separating from the primary adults in their lives and becoming more independent, they are simultaneously moving through the peer play scale stages proposed by Howes (1980).

DISCUSSION

The previously presented information suggests that social play indeed begins in earliest infancy and progresses backwards through the stages proposed by Howes (1980). Further research is obviously needed to evaluate the validity of this sequence. A number of possible areas of further study include the relationship of this play scale to several important areas of development.

Validation of Proposed Sequence

Naturalistic observations as well as more controlled empirical research concerning validity of the proposed sequence needs to be done. Although the literature and practical experience suggest that this sequence does in fact exist, actual study of the sequence and the age ranges needs to be undertaken. It is important that these studies be longitudinal in nature, beginning soon after birth and progressing through the second year.

Validating the sequence will create interesting questions as well. For example, does a child who does not have interactions such as those proposed suffer developmentally? Is the sequence one which is observed between the infant and all adults equally or is it more intense with mothers? Finally, what is the connection between this sequence and attachment classification, self-concept, or future play skills?

Effect of Context on Proposed Sequence

If, in fact, the sequence is correct, other questions arise concerning how universal the sequence is. Carefully controlled studies will reveal whether the interaction, between adults and infants is similar across cultural and socioeconomic groups. As discussed by Nugent and Brazelton (1989), interaction between adults and infants is culturally mediated. Although the content of the play may differ, the context may exist cross-culturally. If, however, research shows that the sequence is culture-specific, it will be interesting to follow the children and determine how later social and play skills compare.

Adult attitudes about their role in the lives of the infants may also be a mediating factor. When examining the effect of context on the sequence, these attitudes must be considered.

Contribution of Adult/Infant Abilities

Just as parental attitude and situation are important to the sequence, so are individual skills and abilities. For example, the importance of affect and emotional development to this sequence may also be of interest. At a recent conference on creativity in infants, Demos (1988) discussed two children she has followed since they were 6 months of age. At 3 years, they are very different both in affect and play behavior. One infant she called Kathy was described as an easy baby with a mother who was not comfortable with direct interaction. At 1 month of age, Kathy's mother interpreted her lack of smile as boredom and would offer Kathy a toy or turn away from her. At 7 months, Kathy showed only mild interest in toys and retained sucking as the prominent mode of exploration. At 8 to 9 months, with the onset of locomotion skills, she began to take more initiative but would often be unavailable to the mother for interactions. Between 16 months and 2 years, her play was often repetitive and aimless when unsuccessful in engaging others in her environment. This developmental picture raises questions about her progress through this proposed sequence. Is it the lack of affect that led to a disturbance in the developmental sequence of social play, or is it the disturbance in the social play sequence that led to a lack of affect? Regardless, early social play and affect/emotional development are very closely linked.

A second area of interest deals with children with various handicapping conditions. In the concern over other areas of development, the importance of play is often forgotten with these children. Already overwhelmed adults may not be able to interact playfully with the child or may deem it unimportant.

Early intervention has been found to ease future developmental problems resulting from an inadequate environment (Nugent & Brazelton, 1989). Perhaps training adults in the stages could prove to be beneficial to both adults and infants. Adults would be more aware of the stages and their importance to total development and perhaps could relax and enjoy play with their infant without feeling as though they are ignoring other areas of development.

Training studies might have other benefits as well. This type of sequence has the potential to affect adult-child relationships. Changes in this relationship as well as infant behavior might result from training caregivers to interact with infants. One area of interest might be teenage mothers and their interactions with their infants before and after training.

Child Care and the Sequence

Finally, another interesting question that arises when considering this sequence is that of the effect of child care on this sequence. Child care out of the child's home presents an interesting situation in that the infant is cared for by an adult with no emotional ties to that infant. Additionally, child care often involves a group of children with a limited number of adults, thus raising several important issues. Can these caregivers who may not be as able to read and interpret infant signals for one reason or another adequately respond to these signals? Does the constant shift in caregivers so prevalent in child care today stress this developmental sequence? And finally, if infants are not receiving these interactions while in care can that be mediated by time with parents or the increased opportunity to interact with peers? If, in fact, infants in child care do not receive the same types of interactions with adults, does this affect the later interactions with peers?

These and other questions arise as we begin to look at the possibility of this sequence. Some may argue that early mother-infant interactions are not actual play. I contend it is play in its purest form as well as the basis for more conventionally studied forms of play. The proposed sequence of adult-child play may represent an important area of development ignored to this point. There is no doubt that this play between an adult and an infant has an important role in the life of an infant. Just how important has yet to be determined.

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***Early Childhood Research Quarterly*, 5, 347-358 (1990)**

FAMILY-CENTERED SERVICE DELIVERY

Over the past decade there has been a shift in the way Early Intervention services are delivered from a primarily "child-centered" approach to one that is "family-centered". As infant development is so closely linked with familial relationships, the entire family unit is the recipient of intervention services. Mandates within the Individuals with Disabilities Education Act (IDEA, 1991, 1997) support the involvement of families in all aspects of service systems. By including family members as planners, decision-makers, and evaluators, a more holistic service system is offered that acts to strengthen the family unit. How to identify, operationalize and validate services that are responsive to family needs has been a topic of investigation since the inception of Early Intervention Programs.

In the area of family play, we find that parents of children with disabilities often do not feel they have permission to take the time to play as programs developed for their children often emphasize therapeutic interventions instead of play. Parents/caregivers *can and must* be an integral part of restoring play as the child's vehicle to development. The role of the family in identifying the most appropriate intervention is critical to a successful experience. Family values, their perceptions of the child's abilities and behavior, daily routines and individual preferences, are among the factors that greatly impact what intervention is used and how.

The compilation of works provided in this section explores issues regarding the development and implementation of family-centered services in Early Intervention Programs. More specifically, authors examine the rationale for a family-centered focus, strategies for documenting family-stated outcomes, as well as current best practices and guidelines for family-centered service provision for practitioners.

Exceptional Children
54(3), 313-328

Family Outcomes in Early Intervention: A Framework for Program Evaluation and Efficacy Research

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Much of the focus on the relationship between parents and professionals in early intervention has been on the rationale for working with families and the processes by which that rationale should be implemented. Although some discussion has occurred regarding desired outcomes, approaches and strategies by which the attainment of family outcomes could be documented have not been widely discussed or agreed upon by the field. In this article we suggest eight questions that could serve as a framework for determining the extent to which early intervention has accomplished the goals inherent in a family-centered approach. Conceptual issues and methodological considerations associated with documenting these outcomes are presented, and recommendations regarding implementation and future directions are made.

Most evaluations of the effectiveness of early intervention have focused on outcomes for children (Bryant & Maxwell, 1997; Spiker & Hopmann, 1997). Child outcomes are an appropriate focus of efficacy research, since concerns about the child's development constitute the essential rationale for early intervention and the focus of most services. Over the past 15 years, however, many have argued that early intervention has a broader purpose. Known by a variety of labels family-focused, family-centered, family-friendly, family-directed- this expanded purpose acknowledges that early intervention also has a responsibility to support families of children with disabilities (Bailey et al., 1986; Dunst, 1985).

Discussions about the relationship between early intervention programs and families have focused primarily on *rationale* and *processes*. Much less attention has been focused on the *outcomes* expected as a result of working with families. This article proposes a framework around which family outcomes could be assessed. We begin with a brief overview of the rationale for working with families and the processes acknowledged to be associated with a family-centered approach. Following a discussion of the challenges inherent in assessing family outcomes, we suggest eight questions around which program evaluation and efficacy research could be structured. Conceptual and assessment issues associated with each are presented and recommendations regarding implementation and future directions are made.

THE RATIONALE AND PROCESSES FOR WORKING WITH FAMILIES

Working with families has always been a significant part of early intervention. The initial rationale was to enhance child development and support parental caregiving, reducing the need for institutional care. Part H of the Individuals with Disabilities Education Act (IDEA) asserted that a major goal of early intervention is "to enhance the capacity of families to meet the special needs of their infants and toddlers with disabilities" (Education of the Handicapped Act Amendments of 1986, Pub. L. No. 99-457, 100 Stat. 1145). Families and professionals soon realized, however, that working with families often led to activities other than teaching or providing therapy for the child, leading a number of authors to argue that working with families is justifiable on the basis of supporting the family, even if such support does not directly enhance the child's development (Bailey et al., 1986; Brewer, McPherson, Magrab, & Hutchins, 1989; Dunst, 1985; Shelton, Jeppson, & Johnson, 1987). Three themes have emerged in recent years. First, families vary considerably in resources, priorities, concerns, and culture. Thus an individualized approach is needed to accommodate individual family preferences, which for some families may include a desire for services (e.g., family support) that go beyond promoting child development. Second, families should be partners in planning and providing services. Thus a new relationship between parents and professionals needs to be forged, recognizing, valuing, and supporting this partnership in ways that are culturally appropriate and consistent with the roles parents desire. Finally, families are viewed as the ultimate decision makers and long-term caregivers of their children. Thus, enabling families to feel competent as advocates is of paramount importance.

The changing rationale for working with families has consequences in the way professionals interact with families. Federal legislation requires early intervention professionals to develop an individualized family service plan (IFSP) with families. In creating the plan, professionals need to be prepared, if parents wish, to assess family resources, priorities, and concerns-factors that should be considered in determining goals and activities. The plan may include outcomes for families and a service coordinator who must be assigned to support the family's efforts to gain access to and coordinate services. In a family centered approach, professionals collaborate with families to select and implement early intervention services, requiring active efforts to support families as full partners (Shelton, Jeppson, & Johnson, 1987). Logical extensions of this perspective are an emphasis on family choice and family strengths (Allen & Pert, 1996; Turnbull, Turbiville, & Turnbull, in press). It then becomes encumbent upon professionals to make services accessible, individualized by family needs and preferences, and flexible in accordance with family priorities.

A family-centered perspective should permeate all aspects of service (e.g., establishing a program philosophy, screening, child assessment, team meetings and program planning, intervention activities, service coordination, transition), not limited to social work or counseling (Bailey, Buysse, Edmondson, & Smith, 1992). Case studies (e.g., Turnbull & Turnbull, 1985) and recent research (e.g., Dinnebiel, Hale, & Rule, 1996) consistently suggest, however, that the essence of a family-centered approach lies in the relationship that exists between parents and professionals. Desirable characteristics of this relationship include trust, mutual respect, open and clear communication, a collaborative attitude, follow through, and interpersonal skills (Dinnebiel & Rule, 1994; Dunst, Johanson, Rounds, Trivette, & Hamby, 1991).

IDENTIFYING AND ASSESSING FAMILY OUTCOMES

As philosophy and practice continue to change, legitimate questions have arisen regarding what might be the result when a program "becomes" family centered. The logic described above constitutes a philosophical and moral argument, the essence of which is that family-centered practice represents the kind of relationship that ought to exist between families and professionals. From this perspective, documenting the extent to which family-centered practices are implemented becomes sufficient as an evaluation end. However, in an era of outcomes-based expectations, documenting practices may be insufficient. Thus the focus shifts to determining whether a family-centered approach results in identifiable benefits. Attempts to answer this question raise a wide range of evaluation issues, centering around two concerns: (a) What are expected family outcomes? and (b) How should those outcomes be assessed?

Expected Outcomes of Family-Centered Practice

Although most researchers and practitioners would agree on outcomes desired for children (Bailey & Wolery, 1992), the identification of family outcomes has been more elusive. Evaluations of family support services outside of early intervention have often focused on outcomes such as depression, parent knowledge of developmental milestones, parent attitudes toward childrearing, or parent-child interaction (e.g., Reis, Orme, Barbera-Stein, & Herz, 1987). Many would argue that an effective family-centered approach is one that enhances the family's capacity to meet their child's special needs. Dunst, Trivette, and Deal (1988) maintain that such a perspective reflects a limited view of why we work with families, and suggest that the ultimate goal of early intervention is to enable and empower families, under the assumption that a strong and supported family is the essential outcome. In their evaluation of a 1-year early intervention effort for infants with disabilities, Shonkoff, Hauser-Cram, Krauss, and Upshur (1992) assessed family outcomes in three areas: (a) amount and quality of mother-child interaction, (b) size and helpfulness of the family's social support network, and (c) stress as perceived by parents. Turnbull et al. (in press) conceptualize family outcomes in two broad classes: (a) motivation outcomes (self-efficacy, perceived control, hope, energy, and persistence) and (b) knowledge/skill outcomes (information, problem-solving, coping skills, and communication skills).

These perspectives provide important insights into possible benefits for families, but clearly the field has not reached consensus as to desired family outcomes. It could be argued that because each family is unique, evaluations should be individually designed to assess the extent to which preferred outcomes are achieved. This approach, while intuitively appealing and appropriate for an individual family, does not lend itself to the evaluation of outcomes for families as a class of recipients of a broad program of services.

Measuring and Assessing Family Outcomes

Assuming the field could agree on a desired set of family outcomes, how should those outcomes be assessed? Measurement issues are critical in any evaluation endeavor, but are especially complicated in the context of families (Bailey & Henderson, 1993; Henderson, Aydlett, & Bailey, 1993). A family typically consists of more than one member; thus an initial decision is who constitutes the family and which family members will participate in the outcome assessment. Measurement strategies typically call for "objective" assessment by an individual who has no personal investment in whether the outcomes are attained. However, in the case of family assessment, the attainment of most family outcomes (e.g., hope, perceived control) is a personal experience that can only be reported by family members themselves. Most family assessment instruments have been limited to paper-and-pencil responses to survey items. Although the advantages of this method are simplicity and economy, the interpretation of responses is limited to the response sets provided on the protocol. A better understanding can be attained through interviews or direct observation, but these methods are time-consuming to administer and interpret. Finally, measurement instruments often rate performance in comparison with some standard, either a normative group or some criterion for success. In the case of families, however, it would not be appropriate to compare families with some norm group. These challenges are not insurmountable, but they suggest that the application of common measurement approaches to assessing family outcomes has significant limitations that must be addressed.

A PROPOSED FRAMEWORK FOR ASSESSING FAMILY OUTCOMES

Assessment of family outcomes in early intervention is an important activity, fraught with conceptual and measurement challenges. Recently we have been involved in the design of a longitudinal study of children and families participating in early intervention. In approaching this challenge, we reviewed relevant literature, spoke with colleagues, practitioners, and family members, and engaged in discussions among ourselves as to outcomes that should be assessed. As a result we identified two broad types of family outcomes and eight questions we believe to be consistent with current values, theories, and models of family functioning and relationships between families and professionals across the life span, and reflect outcomes that early intervention could be expected to impact. In the remainder of this article, we provide a rationale for the questions and discuss significant issues associated with each.

The discussion is prefaced by several caveats. The framework has not been validated and thus is offered as a vehicle for discussion. Although we identify measurement issues, we do not attempt to suggest specific ways that each question might be approached. Depending on the evaluation activity, a range of quantitative and qualitative approaches could be used. We recognize that it may not be possible or even desirable to document all outcomes for every family, that to various outcomes, and that some outcomes are more easily attainable than others. Finally, there may be other perhaps equally compelling questions that could be asked, but to us these seem to be the key questions.

Family Perceptions of the Early Intervention Experience

The first set of questions focuses on the family's perception of the early intervention experience. Historically framed as satisfaction with services, these questions address perceptions of the appropriateness, efficacy, responsiveness, and individualization of services for both the family and the child. We suggest that a positive view of the interactions and services in early intervention constitutes one valid indicator of the efficacy of those services.

1. Does the family see early intervention as appropriate in making a difference in their child's life? Most evaluations of the effectiveness of early intervention have assessed changes in child development or behavior, usually with standardized instruments, direct observation, or clinical judgment rated from the perspective of a professional evaluator. With family outcomes, the question is whether families think their child received the services they felt were needed and whether they perceive those services as having a positive impact on development and behavior.

Such outcomes traditionally have been assessed with parent satisfaction measures. Satisfaction with services is an important outcome because of its conceptual fit with a family-centered perspective and because consumer satisfaction has been related to more active participation and follow through in medical and educational services (Cadman, Shurvell, Davies, & Bradfield, 1984; Lewis, Scott, Pantell, & Wolf, 1986) as well as to the perceived benefits of services (Meyers & Blacher, 1987). Although seemingly a straightforward and easily measurable construct, the meaning of responses to satisfaction measures can be difficult to assess since many parents have no standard against which to judge the services their child is receiving (Simeonsson, 1988). McNaughton (1994) suggests that most parents report a high degree of satisfaction with early intervention services, describes a number of conceptual and methodological challenges associated with satisfaction measures, and argues that more effective strategies need to be developed. Needed are better reliability and validity studies of satisfaction measures, strategies to compare parent expectations as a baseline against which outcomes can be judged, and repeated assessment of satisfaction, especially as programs and services change (McNaughton, 1994).

Despite the methodological challenges, satisfaction with child services is a critical outcome because parents typically rate services for the child as being of highest priority. In selecting or constructing outcome measures, evaluators should take care to ensure that at least two important goals are accomplished. The measures should cover the range of services provided. Dimensions to consider would include (a) the amount of services received, differentiating special education, various therapies, and other services; (b) the quality of services received (e.g., sensitivity of professionals to child's needs and style, ability to establish rapport, ability to communicate effectively with parents, whether services directly address perceived needs); (c) the extent to which services are perceived to have affected the child's development; and (d) an assessment of whether parents believe that goals established for the child on the IFSP were attained.

Second, multiple strategies should be used to reduce the tendency to rate services positively, failing to differentiate between good and weak services (Cryer & Burchinal, 1997). These strategies could include focusing on specific practices rather than assessing overall satisfaction (e.g., Simeonsson, Smith, Edmondson, Carnahan, & Bucy, 1995). Parents can rank order or cluster practices or services using techniques such as Q-sorts (e.g., presenting a list of practices or services and asking parents to sort into two piles, one reflecting the best services and the other reflecting services or dimensions of practice that could be improved). Discrepancy measures could ask parents to rate practices on dimensions of both typical and desired practice (with the extent of discrepancy then used as an index of satisfaction). Opportunities could be provided for discussion of perceptions of child benefits through interviews, open-ended questions, or focus groups. Parents could also be asked to rate not only services, but specific outcomes and progress for children. The response set should include the opportunity to indicate whether their child's progress was more or less than what would have happened without services.

2. Does the family see early intervention as appropriate in making a difference in their family's life? The issue in Question 2 is the family's perception of the impact of early intervention on the family, beyond that perceived for the child. Maternal stress was identified early as a possible result of having a child with a disability and is an example of a family outcome documented in numerous studies (e.g., Gallagher, Beckman, & Cross, 1983; Lipsky, 1985). Stress may prove to be an unsatisfactory index of effectiveness, however, as it is a fairly stable trait difficult to modify in the context of early intervention (Krauss, 1997). A more appropriate focus may be the routines and activities constructed by families in order to achieve basic family functions (e.g., child care, recreation, education, employment, household tasks). Although most research and intervention models have focused on mothers (Krauss; Shonkoff et al., 1992), we envision this question addressing the family as a whole.

A child with disabilities can affect various dimensions of family life. Gallimore, Weisner, Bernheimer, Guthrie, and Nihira (1993) describe accommodation as the process by which families "create and maintain a daily routine in response to sometimes conflicting circumstances" (p. 186), and suggest that families of children with disabilities often face accommodation requirements not faced by other families. Barnett and Boyce (1995), for example, found that parents of children with Down syndrome differed from parents of children without disabilities in their patterns of time use, spending more time in child care, less time in social activities, and (for mothers) less time in paid employment. Warfield and Hauser-Cram (1996) document the challenges that parents of young children with disabilities face in seeking child care. Even the way in which child services are provided could determine the nature and type of accommodations a family needs to make. For example, if speech therapy is provided at the child's day care, one might assume fewer disruptive accommodations than if the parents needed to take the child to a special clinic.

Although research suggests that family accommodations are not frequently addressed as potential outcomes (Bailey, Winton, Rouse, & Turnbull, 1990; Mahoney & Filer, 1996), effects on family life are feasible and should be assessed. We assume that early intervention could have a moderating effect on these accommodations that services can both shape families' perspectives and provide resources (e.g., information, equipment, skills). In this way, families may be able to construct routines and adapt activities to correspond more closely with their own cultural and familial expectations (Bailey, McWilliam, Buysse, & Wesley, in press).

How might we assess the effects of early intervention on family life? First, one could ask whether services addressed the family's identified needs. These needs could encompass such areas as information, social support, finances, explaining the child's disability to others, childcare, professional support, community services, or family functioning (Bailey & Simeonsson, 1988). Second, evaluators could determine the extent to which families perceive early intervention services to be culturally and personally appropriate. In other words, once needs are identified, are the services provided what the family wants, or does the family have to fit its needs into the existing menu of services? Third, and of ultimate importance, is the extent to which early intervention actually helps families achieve family goals. This could include (a) documenting the attainment of IFSP goals, (b) assessing the nature and amount of accommodations to daily routines that families must make, or (c) determining the extent to which those accommodations are perceived as successful and acceptable (Bernheimer, Gallimore, & Kaufman, 1993; Gallimore et al., 1993).

Needs assessment, satisfaction with services, goal attainment, and family accommodations can be determined through written instruments or document review. Making accommodations (e.g., Bernheimer et al., 1993) and expressing unmet needs (e.g., Able-Boone, Sandall, Loughry, & Frederick, 1990; McWilliam, Lang, et al., 1995) have been most successfully documented through interview procedures. Interviews can be undertaken with individual families or family members, as in case studies (McWilliam, Lang, et al.), or with groups of families, as in focus groups (Brotherson & Goldstein, 1992).

3. Does the family have a positive view of professionals and the special service system? Parents and professionals engage in formal and informal interactions through phone calls, home visits, meetings, and therapy or clinic visits. These interactions constitute encounters in which mutual expectations are defined, needs and resources identified, services planned and implemented, and outcomes documented (Simeonsson et al., 1996). They operate in a transactional fashion, such that parents and professionals construct views of each other as individuals and as representatives of their respective groups. Early intervention can play a defining role in determining how parents perceive professionals and services, both now and in the future. Ideally, at the end of the early intervention experience, families should have had encounters that support the belief that the service system is accessible and helpful, and that service providers will be supportive, responsive, and respectful.

The extent to which this outcome is achieved varies as a function of parents' initial expectations regarding the nature of encounters with professionals and the extent to which those expectations are met. Case studies by Turnbull and Turnbull (1985) document how early negative experiences play a powerful role in shaping negative views of professionals and the service system. Such experiences may be the result of seemingly insensitive or unresponsive approaches taken by professionals. In other instances professionals may not understand, respect, or make accommodations necessary to support families from America's diverse cultures.

Fortunately, most parents resist generalizing negative experiences with particular individuals if encounters with other professionals are positive, as in the case of families who may be angry at the way a physician treated them during the informing process but are pleased with the support of an early intervention teacher. Families may feel positive about their individual service provider (McWilliam, Lang, et al., 1995; McWilliam, Tocci, & Harbin, 1995), but negative about the service system. McWilliam, Lang, et al., for example, found that although individual professionals and professional-family relationships were among the most positive experiences reported by six case study families, these same families reported having to struggle for services.

Despite these struggles, early intervention may be one of the most positive experiences that parents of children with disabilities will encounter. Some research suggests that ratings of professionals and services become less positive as the child gets older (Mahoney, O'Sullivan, & Dennebaum, 1990; McWilliam, Lang et al., 1995). Families often have negative perceptions of transitions (Hamblin-Wilson & Thurman, 1990), and the challenges frequently experienced by parents of school-aged children (Hanson & Carta, 1996; Lesar, Trivette, & Dunst, 1996) provide further evidence that a positive view of professionals and services may not endure. The historical focus of early intervention on family support and recent trends toward family-centered practices suggest that promoting positive relationships with professionals and positive attitudes toward services is possible, and indeed likely, and thus should be documented as an intervention outcome. This outcome differs from those proposed under Questions 1 and 2. Whereas those questions assess whether services were appropriate and outcomes achieved, this domain evaluates whether the relationship between parents and professionals was positive and supportive.

Methods of documenting this outcome need to be constructed. Although traditional satisfaction measures may capture some dimensions, they are likely to be insufficient for methodological (e.g., inadequate instrumentation) and conceptual (e.g., construct validity uncertainty) reasons. General satisfaction measures more often assess services or outcomes, rather than relationships. Measures of specific practices and relationships are needed and alternative formats may be required such as those in which family members compare a continuum of practices they typically encounter with those they would ideally like to encounter (e.g., Bailey & McWilliam 1993; McWilliam & Winton, 1991; Murphy, Lee, Turnbull, & Turbiville, 1995). Semistructured interviews can guide family members in telling their stories as participants in early intervention (McWilliam, Lang, et al., 1995). Analysis of these stories informs us about family members' views of professionals and provides grounded (i.e., noncategorical) dimensions of the family-service provider relationship.

Impact on the Family

The second set of questions focuses on the impact early intervention has on various domains of family life. These questions address the extent to which early intervention fosters parents' perceived competence as caregivers, ability to work with professionals, informal support systems, optimism about the future, and quality of life.

1. Did early intervention enable the family to help their child grow, learn, and develop? Families enter early intervention because they have a child whose development is at risk or who has a developmental disability. For many families, a goal of paramount importance is creating a successful daily routine in which they feel competent as caregivers and their children are competent as learners. Much has been written about the importance of parent-child interactions, and many early intervention models rely heavily on parents as the primary providers of teaching and therapeutic experiences (McCollum & Hemmeter, 1997; Spiker, Ferguson, & Brooks-Gunn, 1993). Three assumptions underlie these models. First, it is assumed that the quality of interactions that parents have with their children bears directly on the outcomes experienced by children, an assumption strongly supported by research on typically developing children (Lyons-Ruth & Zeanah, 1993). Second, it is assumed that parents as primary caretakers spend the most time with the child and thus represent the greatest potential influence in the child's life (Shonkoff et al., 1992). Finally, it is assumed that parents of infants with disabilities often face special challenges in their caregiving roles because of their child's temperament, developmental delays, or difficulty in reading the child's cues (Dunst, 1985; Goldberg, 1977).

Assessing whether early intervention has strengthened parent-child interactions and enabled the family to help their child learn and develop is consistent both with research and philosophy. Most would agree that it is desirable for parents to be and feel competent as caregivers, thereby enhancing their capacity to meet the special needs of their child. As McCollum and Hemmeter (1997) suggest, however, attempts to intervene in parent-child relationships must be approached with caution and be individualized based on family needs, preferences, and culture. If done inappropriately (e.g., parents get the message that they are not competent caregivers or that professionals know better than they about how their child should be reared), well-intended interventions could result in negative iatrogenic effects. This possibility was well-illustrated by Affleck, Tennen, Rowe, Roscher, and Walker (1989) who found that mothers who received help in parenting, despite feeling that they did not need it, felt less competent and were less responsive to their children following the intervention program.

In the search for means to assess family outcomes related to enhancing child development, at least two approaches are possible. In one approach, a set of practices that constitutes appropriate caregiver behaviors is identified. These practices could be assessed by direct observation or parent report using one of a number of scales developed for this purpose (Barnard & Kelly, 1990). If this approach is followed, care must be taken to ensure that the caregiver behaviors defined as "appropriate" are consistent with family and cultural values, and that the assessment process is conducted in a collaborative and supportive manner rather than one which is or seems to be judgmental (Mahoney, Spiker, & Boyce, 1996). An alternative approach shifts documentation from an emphasis on the parent's use of particular strategies to a focus on their perceived competence as caregivers. Although professionals could rate these perceptions, a preferable strategy would be to ask parents directly using measures specifically designed to assess parents' beliefs about their ability to guide and support their child's development effectively (e.g., Devellis et al., 1985; Koren, DeChillo, & Friesen, 1992).

2. Did early intervention enhance the family's perceived ability to work with professionals and advocate for services? A second family impact is the extent to which family members believe they can negotiate the system and feel a sense of efficacy over access to services. In general, this is the outcome Dunst, et al. (1988) and Turnbull and Turnbull (1997) call empowerment. Staples (1990) defines empowerment as "the ongoing capacity of individuals or groups to act on their own behalf to achieve a greater measure of control over their lives and destinies" (p. 30). Empowerment may also include self-efficacy and the ability to identify and remove conditions of powerlessness (Conger & Kanungo, 1988). Research suggests that perceived control over access to supports and services can be enhanced by using certain enabling practices when working with families (Dunst, Trivette, & LaPointe, 1994).

The measurement of empowerment is challenging, because it is an inherently subjective construct that could be evidenced in many ways. One strategy is to use a general measure of the sense of control one perceives over life events, such as that assessed through locus of control scales. Locus of control has been conceptualized on a simple continuum ranging from external (feeling little or no control over life events) to internal (feeling considerable control over life events; Nowicki & Duke, 1974). General measures of locus of control have been shown to predict the extent to which parents of children with disabilities are involved with their children and with services (Helm, Comfort, Bailey, & Simeonsson, 1990; Simeonsson, Bailey, Huntington, & Comfort, 1986), and Affleck et al. (1989) found that a home visiting program for parents of high-risk infants served to increase maternal perception of control over life events.

Locus of control is considered a relatively stable construct, especially in adults, and more specific measures may be needed to assess the family's perception of enabling practices (e.g., Dempsey, 1995) or sense of empowerment (e.g., Koren et al., 1992). Validity data from Koren et al. suggest that empowerment consists of at least three related constructs: sense of control over family events, services and policy. Thus when empowerment is assessed, care must be taken to ensure that the multiple factors constituting this construct are included.

3. Did early intervention assist the family in building a strong support system? The evaluation questions suggested thus far address the family's perception of the formal support provided by professionals. Here the focus is on the extent to which early intervention helps families build and rely on informal social and community support systems. Research documents the protective role that social support plays in the healthy development and functioning of families (Dunst, Trivette, & Deal, 1994). For families of children with disabilities or who face other challenges such as divorce, the nature and amount of social support correlate highly with successful coping (Crnic, Greenberg, & Slough, 1986; Dunst, Trivette, & Cross, 1986). Support can come from one's spouse, family members, friends (Haber, 1987), neighbors, support groups, religious faith, or religious organizations (Weisner, Beizer, & Stolze, 1991).

One might question whether, in the context of an evaluation paradigm, support should be considered an outcome or a mediator variable that influences outcomes. The point could certainly be made that increased support is only useful if such support leads to more successful coping. Although the effects of support are certainly critical, we argue that because of its potential power, and because of the possibility that usual sources of support may be reduced or altered when a family has a child with a disability, changes in support constitute a legitimate outcome variable. Even if support is a mediator of coping, it serves as a more direct effect of early intervention services (i.e., a more proximal outcome) and one more easily defined than coping.

What professional activities could logically contribute to increases in informal and social supports for families? Strategies that might work for some families include parent support groups or other mechanisms designed to help parents meet other families who have a child with a disability. Professionals could work with families to help them locate and identify community-based activities or to build the capacity of supportive organizations such as religious institutions, as in the case of an early interventionist who helps a parent train church workers in how to care for a child with seizures during Sunday School. Trivette, Dunsr, Boyd, and Hamby (1996) argue that professionals are most effective in this arena when they adopt help-giving practices that enhance a sense of community, encourage families to mobilize resources, share responsibility and collaboration, protect family integrity, strengthen family functioning, and adopt prevention and promotion rather than treatment as a service model. Shonkoff et al. (1992) found that families participating in early intervention programs reported increased levels of informal and social support over time. Additional analyses suggested that increases in support were related to a combination of individual and group services, more services, and more participation in parent-support groups.

A number of scales have been developed to measure social support, and research suggests that such scales can provide reliable and valid indicators of support (Dunst, Trivette, & Hamby, 1993) and can be used to measure the effects of early intervention (Shonkoff et al., 1992). Such scales, however, may not provide insight into the meaning and nature of support provided from each source, and if such information is desired as a part of an evaluation plan, it must be gathered through open-ended survey questions, interviews, or observations.

4. Did early intervention help enhance an optimistic view of the future?

> Provide me with some ray of hope. Robbing me of hope is the worst thing you can do to me. Remember that after I leave your office, I will create an atmosphere at home of hope or despair, and surely one of hope is better for my child. You can give me hope through your attitude and through what you say. Your belief that my child could defy the statistics will soften the facts that you must tell me. (Alexander & Tompkins-McGill, 1987, p. 362)

This plea from a parent summarizes the next family outcome proposed. At the conclusion of the early intervention experience, family members should feel increased hope for a positive future for them and their child. Turnbull and Turnbull (1997) define hope as the "belief that you will get what you want and need" (p. 41), an optimistic view that good things will happen in the future.

This outcome is based on the assumption that experience shapes one's views of the possibilities in life, and that a hopeful outlook is desirable since it can lead to feelings of self-assurance and action toward the accomplishment of outcomes (Seligman, 1990; Snyder, 1993). The interactions parents and other family members have with professionals will likely affect their view of the future. Turnbull and Turnbull (1997) suggest that early interventionists can promote an optimistic perspective by acknowledging positive possibilities for the child and encouraging "great expectations." In contrast with traditional perspectives that view highly optimistic parents as "being in denial" with a goal of services being to help parents get a "realistic" view of their child, this perspective suggests that optimism for a positive future is a desirable family outcome.

Measuring hope and optimism poses a particular challenge for early intervention professionals. Although some scales have been developed (Snyder, 1993), most are not specific to hope for the child with a disability. If the field embraces optimism and hope as desired outcomes, reliable and valid ways of assessing this construct will need to be developed. At a more practical level, assessments may be made of the nature of expectations or what is hoped for the child or family, rather than the more global constructs of optimism or hope.

5. Did early intervention enhance the family's perceived quality of life? Thus far, seven questions have been offered in a framework for evaluating family outcomes of early intervention. Although not entirely independent, each attempts to address a different domain. Our final question, the extent to which early intervention has influenced child and family quality of life, is both a synthesis of the first seven questions as well as an extension into a new domain.

Quality of life has emerged as an important theme as increased emphasis is placed on inclusion, equity, empowerment, and community-based supports for individuals with disabilities (Schalock, 1994). As a broad construct, quality of life may serve as a useful indicator of outcomes of policy initiatives such as the Americans with Disabilities Act. As an objective outcome, quality of life can be defined in terms of available resources and opportunities such as access to health care, employment, and social integration. Subjective dimensions are associated perceptions of life quality in terms of physical, economic, and psychological well-being.

Although most of the literature on quality of life has focused on adolescents and adults, a strong rationale exists for extending the construct to infants and families in early intervention. Important issues to address include how to define quality of life, what dimensions of quality of life are important in evaluating outcomes, and what methods best measure those outcomes.

Researchers generally agree that quality of life is an intensely personal and complex construct (Coulter, 1990; Dennis, Williams, Giangreco, & Cloninger, 1993). Goode (1990) proposes that quality of life is the ability of an individual to meet important needs in major life settings such as work, school, home, and community while satisfying the normative expectations of others in those settings (p. 46). Coulter (1990) defines quality of life as "a sense of personal satisfaction with life that is more than just pleasure or happiness and yet something less than meaning or fulfillment" (p. 61). Moss (1994) suggests that quality of life is not an objective reality but a subjective perception that evolves over time and reflects the priorities, beliefs, and values of individuals. Indicators believed to be related to quality of life include independence, standard of living, productivity, family relationships, community integration, health, safety, leisure activities, and a perception of life satisfaction (Dennis et al., 1993; Keith, 1990; Schalock, 1993, 1994).

Quality of life is influenced by the full spectrum of individual and family characteristics and experiences, many of which (e.g., family wealth, tragedies or successes in other areas of life, physical and mental health, interrelationships among neighbors or extended family members) are beyond the purview of early intervention. Mitchell (1993), however, argues that early intervention can play an important role in enhancing the quality of life experienced by families. The outcomes proposed in this paper may be important contributing factors to perceived well-being and overall quality of life. Services promoting an enhanced sense of competence as a caregiver, a sense of control and stability in life, and the belief that services had a positive impact may support a sense of hopefulness and optimism. Parents who feel confident and competent in their capacity to advocate for their child and family, are able to establish and maintain positive and productive relationships with professionals, and feel competent to make decisions in the best interest of their child and family may experience an increased sense of personal control and independence. The extent to which services facilitate families' efforts to build and rely on strong support systems, promote a positive perception of professionals, and help parents feel hopeful and optimistic about the future may have a positive impact on psychological well-being and life satisfaction.

Is quality of life essentially a summary of the first seven questions or does it reflect a qualitatively different construct? We all know individuals who seemingly have everything and are unhappy, as well as individuals who seem to experience constant challenges yet are thankful for what they have and are generally pleased with life. Thus we suggest that overall perception of quality of life probably represents more than the sum of the other family outcome domains.

Efforts to assess quality of life can present a formidable challenge. Heal and Sigelman (1990) describe four potential methods: (a) objective or subjective ratings, (b) measures of an absolute or relative standard, (c) procedures in which the informant is the subject of interest or the informant is a familiar and informed other, and (d) subject-generated or investigator-generated measures. Objective ratings focus on external, environmental indicators of people's lives, such as employment, income, housing, patterns of behavior, or health. Measures attempting to assess an individual's perception of such dimensions as psychological well-being, personal satisfaction, and happiness are defined as subjective. An absolute measure is one that attempts to index one's quality of life directly. The extent to which a measure is able to compare quality of life to a proposed standard of what might be desired by most people is considered to be relative. Quality of life measures can be completed directly by the individual or by a familiar person such as a relative, friend, or service provider who can provide informed views about an individual's life circumstances. Instruments can be based on explicit input from respondents who might recall events which they perceive to have enhanced or worsened their lives.

These different methodological approaches can be used with various types of formats, such as surveys or interviews composed of open and closed-ended questions, checklists, rating scales, or direct observations. Variables that could threaten validity or reliability of quality of life measures include how the data are collected, how questions are phrased, characteristics of the interviewer, and characteristics of the respondent (Heal & Sigelman, 1990). Research suggests that the use of multiple methodologies may diminish some of these problems (Heal & Sigelman, 1990). A number of quality of life instruments have been developed, particularly for use with adults with disabilities (e.g., Keith, Schalock, & Hoffman, 1986). Few have directly addressed family quality of life, although many relevant dimensions have been assessed (McCubbin & Thompson, 1987). It may be that several measures should be used to assess multiple dimensions contributing to perceived quality of life such as support, stress, or child characteristics. Standardized measures used together with qualitative methods may reduce methodological weaknesses and provide a more accurate assessment of quality of life. Despite the complexity of the construct, it is also possible that quality of life can be rated as a single global perception.

IMPLICATIONS FOR POLICY AND PRACTICE

Questions regarding the efficacy of early intervention will continue to be asked. Although historically those questions have focused on child outcomes, with a substantive focus now on the role of professionals *vis-a-vis* families in early intervention, it is natural that we ask to what end family-centered practices are intended. In part the answer to this question will reflect the evolving nature of policy and practice with regard to the relative resources invested in child and family services. Most interventions still focus on the child and changes in the child are viewed as the ultimate indication of intervention efficacy. For many, changes in other members of the family or the family as a whole are only beneficial and relevant to early intervention if they result in subsequent improvement in the child's behavior and development. A major policy issue yet to be determined is the relative importance of child versus family outcomes. One can envision a scenario in which the child makes little progress but much has changed in the family with respect to the questions suggested in this paper. Would this be considered a successful early intervention effort, or is child change a necessary part of the efficacy equation? In many ways these two domains are inextricably linked to each other and perhaps the issue is best framed in the context of how family and child needs can be integrated into a comprehensive system of early intervention services.

Ultimately the field must decide whether the results of early intervention efforts, in terms of documented outcomes for clients, constitute a necessary or sufficient basis for determining if our efforts have been justified. Whether we agree with this perspective or not, an expectation of overall efficacy is and likely will continue to be held for the field by consumers and policymakers. Thus it becomes incumbent upon us to reflect on why we engage in what we do and what are both desirable and realistic expectations for outcomes for all clients of early intervention, which include both children and families.

In this article we have built upon the research of many colleagues to suggest a set of questions that might constitute a reasonable framework for determining family outcomes in early intervention. The questions overlap in some areas, and many different strategies could be used to answer each. It may not be reasonable to expect benefits in each area for all families. However, we argue that, if none or only a few of these outcomes are achieved or if they are achieved with only a selected subset of families served, then fundamental and illogical discrepancies exist between philosophy, practice, and outcomes. We hope these questions serve as a stimulus for discussion, debate, research, and reflection among researchers, parents, university faculty, practitioners, and policymakers engaged in fundamental inquiry into the purposes and anticipated benefits of early intervention.

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The work reported herein was supported, in part by award #H159E50001, Office of Special Education Programs, U.S. Department of Education, and in part by award # R307A60004, National Institute for Early Education and Development, Office of Educational Research and Improvement, U.S. Department of Education. However, the contents do not necessarily represent the position of the U.S. Department of Education, and endorsement by the Federal government should not be assumed.

Manuscript received April 1997; revision accepted September 1997.

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58(2), 156-165

Professional Skills, Concerns, and Perceived Importance of Work with Families in Early Intervention

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ABSTRACT: Innovations *brought about by Public Law 99-457 require early intervention personnel to expand their work practices to involve and support families in the provision of early intervention services. To support training needs in this area, and to understand possible barriers to change, this study examined the extent to which 142 early interventionists from two states felt competent in working with families, valued family roles, and, were concerned about changing to family-centered practices. Relationships among these characteristics and experience, discipline, and job category were explored. In general, nurses and social workers scored higher than did educators and other health-care professionals on several dimensions of family-centered care. Many professionals expressed concerns about collaboration.*

The effectiveness of early intervention for children with disabilities and their families is likely to be influenced by the extent to which early intervention professionals are adequately trained. Factors such as age of children served, diverse intervention settings, the need for interagency collaboration, and the central role of families all point to the need for specialized training (Bailey, 1989; McCollum & Thorp, 1988). Unfortunately, there are several barriers to assuring a full cadre of qualified professionals: personnel shortages (Meisels, Harbin, Modigliani, & Olson, 1988); diversity in staffing patterns and expertise (McCollum & Hughes, 1988); inadequate preservice training in nearly every discipline (Bailey, Simeonsson, Yoder, & Huntington, 1990); discrepancies between typical and desired practices (Bailey, Buysse, Edmondson, & Smith, in press); and staff turnover, especially among allied health professionals and other consultants (Palsha, Bailey, Vandiviere, & Munn, 1990)

Of special significance is the preparation of personnel to work with families. The requirements of Public Law 99-457 regarding the Individualized Family Service Plan, family assessment, and case management suggest that early intervention personnel will need unique expertise in how to involve and support families. The legislation reflects a philosophical shift in early intervention from a child-focused activity to a family-centered enterprise (Bailey, 1987; Brewer, McPherson, Magrab, & Hutchins, 1989; Dunst, 1985; Shelton, Jeppson, & Johnson, 1987). Despite acceptance of the principles, of family-centered care in the professional literature, however, establishing family-centered practices is likely to be a challenging process. Bailey, Simeonsson, Yoder, and Huntington (1990) found coursework related to the work with families to be among the weakest aspects of preservice training programs in a number of key disciplines. Bailey et al. (in press) found that professionals reported substantial discrepancies between how they actually worked with families and how they thought they should be working with families. Research by Mahoney and O'Sullivan, (1990) and Mahoney, O'Sullivan, and Fors (1989) suggests that family-centered practices have not been well established; in many cases, a family centered approach is defined as the involvement of families in the treatment of children rather than enhancing the broader goals of family support (Zigler & Black, 1989)

A key to maximizing the effectiveness of training, especially at the inservice level, is linking training to the broader goal of facilitating change in practices. Research on the process of change suggests that many factors are involved, including characteristics of the people involved, the quality of training provided, the ecology in which change is expected, and the provision of support and follow-up (Fullan, 1982; Joyce & Showers, 1988; Mann, 1978). The focus of this article is on the first of these variables, characteristics of the people who are expected to change their practices. We address three domains: perceived ability related to the demands expected by the change, the extent to which the expected role is valued, and concerns about the change.

VARIABLES STUDIED

Perceived Ability

One variable likely to influence the implementation of new practices is the extent to which a person perceives that he or she has the necessary skills. Bandura (1977) proposed a transactional model in which self-efficacy both influences one's willingness to try new procedures and is, in turn, influenced by subsequent success:

> Expectation of personal efficacy determines whether coping behavior will be initiated, how much effort will be expended, and how long it will be sustained in the face of obstacles and aversive experiences. Experiences of mastery [produce] further enhancement of self-efficacy. (p. 191)

The locus of control literature (e.g., Joe, 1971; Lefcourt, 1976) has suggested that perception of control over life events is strongly related to achievement and depends in part on perceived perception of competence., Guskey (1988) found teachers' perception of efficacy and self-concept as a teacher to be related to each other and also related to their ratings of the importance of a training experience. Stein and Wang (1988) concluded, "Perceived self-efficacy is the one teacher characteristic that consistently has been found to be related to successful implementation of innovative programs and student learning" (p. 174).

Value of the Training or Innovation

A second variable is the extent to which a person believes that the new role or task is important and is consistent with expectations for professional roles. Berman and McLaughlin (1975), as reported by Stein and Wang (1988), found in the Rand Study that "if the values and goals implicit in the project's design were not congruent with those of the project participants, the innovation was likely to be either symbolically implemented or not implemented at all" (p. 18).

Concerns About the Change

Fuller (1969) suggested that the specific concerns teachers have about a practice or procedure might influence their willingness to learn about it and use it. Fuller described a three-phase developmental sequence of concerns: nonconcern, concern with self, and concern with pupils. Hall and Loucks (1978) proposed a seven-stage model of concerns:

Stage 0 (Awareness): Professionals have little concern about or involvement with the innovation.
Stage 1 (Informational): The primary concern is knowing more about the innovation.
Stage 2 (Personal): Professionals ask how the innovation will affect them personally, often with corresponding concerns about personal adequacy to meet new expectations.
Stage 3 (Management): Concerns focus on the implementation of the intervention-how, when, and where it is to be implemented.
Stage 4 (Consequences): The professional is concerned about the extent to which the innovation will have a positive impact on the children or families served.
Stage 5 (Collaboration): Concerns usually are expressed by administrators or team leaders who are concerned about collaboration and

cooperation among professionals in implementing the innovation.

Stage 6 (Refocusing): The professional evaluates the innovation and is concerned about either modifying the innovation to make it more effective or considering alternative innovations.

An assumption underlying the Hall and Loucks model is that effective training must be matched to the needs and concerns of the participants. Concerns are assumed to follow the identified sequence of stages, and various strategies have been suggested for training at each level of concern (Hall, 1979; Hall & Hord, 1987; Hord, Rutherford, Huling-Austin, & Hall, 1987). Bailey and Palsha (in press) demonstrated the applicability of the concerns-based model to early intervention, but presented evidence in support of a simpler five-stage model.

Summary and Research Questions

Research on individual characteristics has focused almost exclusively on teachers and their reactions to proposed changes in teaching strategies. This study examines the concerns, skills, and values of professionals from several disciplines, all of whom are expected to respond to current demands for family-centered practices. The study was designed to answer five questions:

1. How do professionals perceive their ability to work with families?
2. To what extent do professionals value work with families?
3. What concerns do professionals express about changing to family-centered early intervention?
4. What are the interrelationships between perceived ability, value, and concerns about family-centered practices?
5. Are ratings of ability, value, or concerns influenced by variables such as years of experience, discipline, or job type?

METHOD

Subjects

The subjects were, 142 professionals from two states working in early intervention programs serving infants and toddlers with disabilities and their families. Sixty-five of the professionals worked in a southern state and 77 in a mid-Atlantic state. They were primarily female (98%) and Caucasian (89%). The majority (51%) held a master's degree. The mean age was 35.9 years (range = 22-58 years); the average professional had worked 7.3 (*SD* = 5.2) years with persons with disabilities and 5.6 years (*SD* = 4.2) with infants and preschoolers. Over half (57%) were direct service providers, 16% were administrators, and 3 % were consultants. The remainder worked in other positions, such as case manager, social worker, or a combination of both administrator and service provider.

Instrumentation

Each participant provided information about training experience, discipline, and other personal characteristics. Three measures were used to document, perceived skills, values, and concerns about working with families.

Perceived Skills. Perceived skills were assessed using Self-Rating of Skills and Knowledge in Early Intervention (Bailey, Buysse, & Palsha, 1990), a measure on which respondents assigned a self-rating regarding knowledge (theories, instruments, or procedures) and skill (clinical expertise) in 16 areas of professional competence. The rating for each was on a 1-5 scale (1 = very little, 3 = some, and 5 = a lot). Previous research has shown that items on the scale cluster into three domains-child skills, family skills, and team skills-with high internal consistency for each factor (Bailey, Buysse, & Palsha, 1990).

Value of Professional Roles. The Interventionist Descriptor Scale (Simeonsson & Bailey, 1983,1990) was used to determine the extent to which professionals valued family roles in their work. Subjects in the second state completed a revised version of the instrument, which included two additional statements. Half the items on both scales are roles related to working with families (e.g., assesses family needs, communicates effectively). The other items refer to child-related roles (e.g., assesses children's skills, designs interventions for children). The interventionists were asked to identify the 10 (original version) or 8 (revised version) descriptors that they felt were most important to their work. For the purpose of this study, a single score was generated indicating the percentage of family-related items identified, providing an estimate of the extent to, which each professional endorsed family roles in their work.

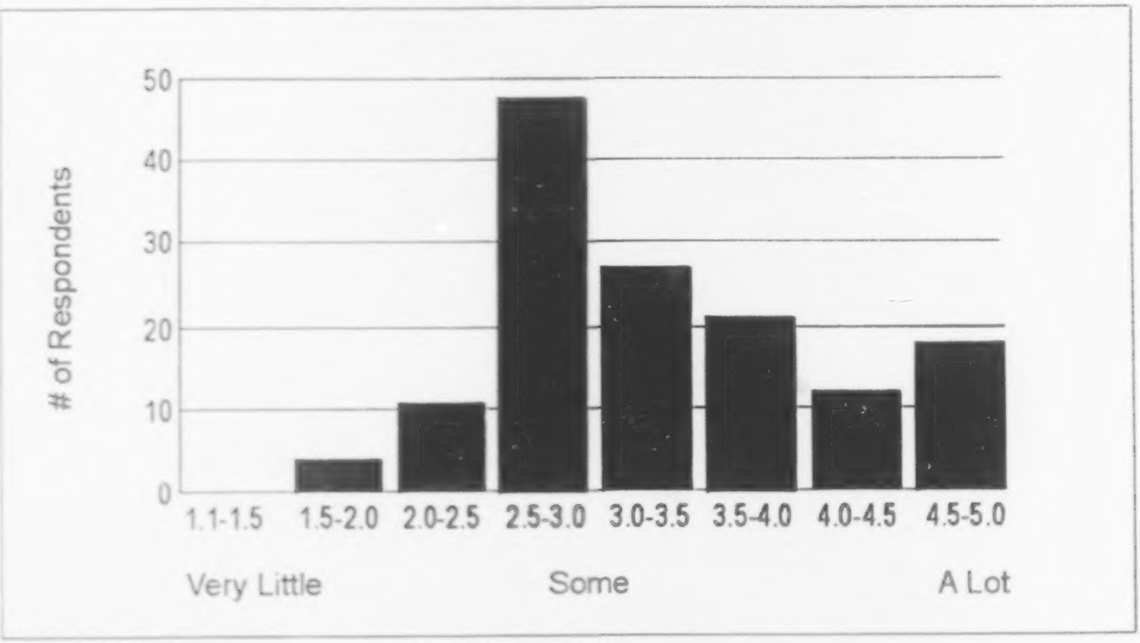
Concerns. The Stages of Concern Questionnaire (SoCQ) (Hall, George, & Rutherford, 1986) was used to assess concerns related to family-centered services. The SoCQ consists of 35 statements, each relating to a possible concern about an innovation. Each statement is followed by a scale ranging from 0 to 7 (0 = the concern is irrelevant, 1 = not true of me now, 3 and 4 = somewhat true of me now, and 6 and 7 = very true of me now) indicating the extent to which the statement reflects the respondent's current feelings. Based on an earlier study, (Bailey & Palsha, in press) the original 35-item, 7-stage SoCQ was revised to include only 15 items based on a 5-stage model.

RESULTS

Several techniques were used in the analyses. Given that the sample population came from two different states, all statistical analyses were run and are reported with state of residence as a second independent variable, to control for

FIGURE 1

Mean Rating of Family Skills and Knowledge



possible state main effects and state interactions. For all analyses, no interactions were found. Only on the Stages of Concern instrument were significant state main effects found. The southern state had significantly higher concerns for Stages 1, 2, and 5: the mid-Atlantic state had higher concerns for Stage 4. Despite these findings, the pattern of concerns was virtually the same for both states. The results are organized and presented according to each of the five research questions.

Perceived Ability to Work with Families

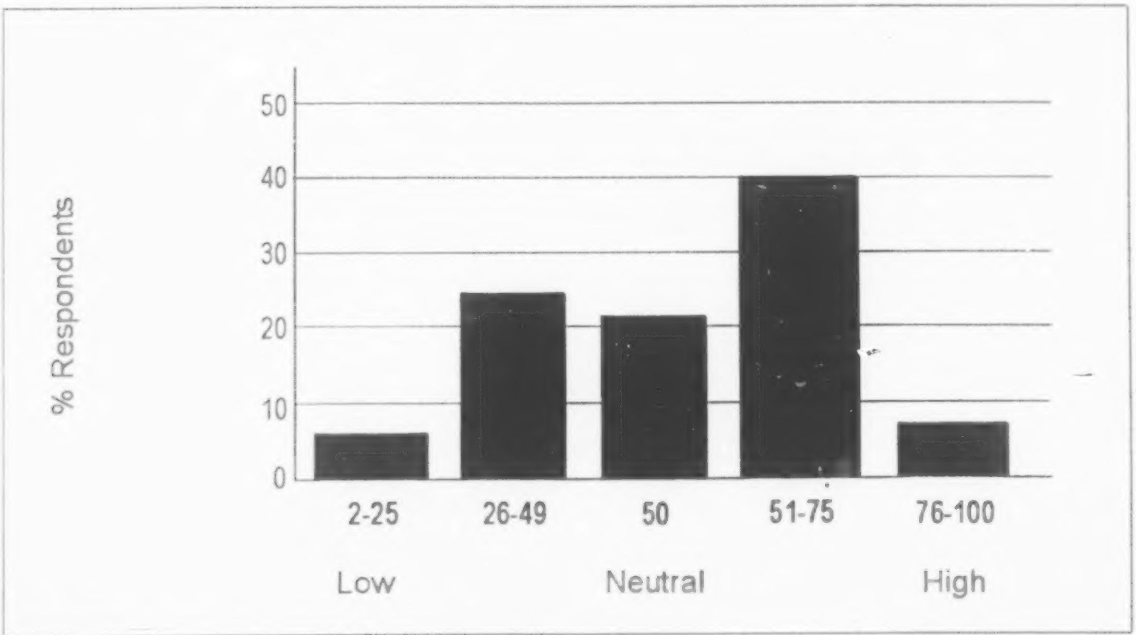
Perceived competence in working with families was as determined by responses to the nine family items on the self-rating of knowledge and skills. The mean item rating of all professionals was 3.4 (SD =78). out of a maximum rating of 5, indicating a moderate level of perceived competence. A paired *t*-test comparison revealed that ratings of skills in working with families were significantly lower than ratings of skills in working with children ($t = 2.2$, $p < .03$). Figure 1 shows a frequency distribution depicting the number of respondents by level of self-rated competence in family skills.

Perceived Value of Work with Families

The extent to which professionals valued roles associated with working with families was determined on the basis of responses to the Interventionist Descriptor Scale (IDS). The typical professional endorsed 54.3% of their most valued roles as family roles. Nearly half (48%) rated the majority of most important roles as family related; 22% rated an equal number of child and family roles, and 30% endorsed a majority of child roles. Figure 2 shows the distribution of the extent to which

FIGURE 2

Interventionist Descriptor Scale. Distribution of Respondents According to the Perecntage of Family-Oriented Rates Endorsed



respondents valued family roles.

Concerns About Family-Centered Early Intervention

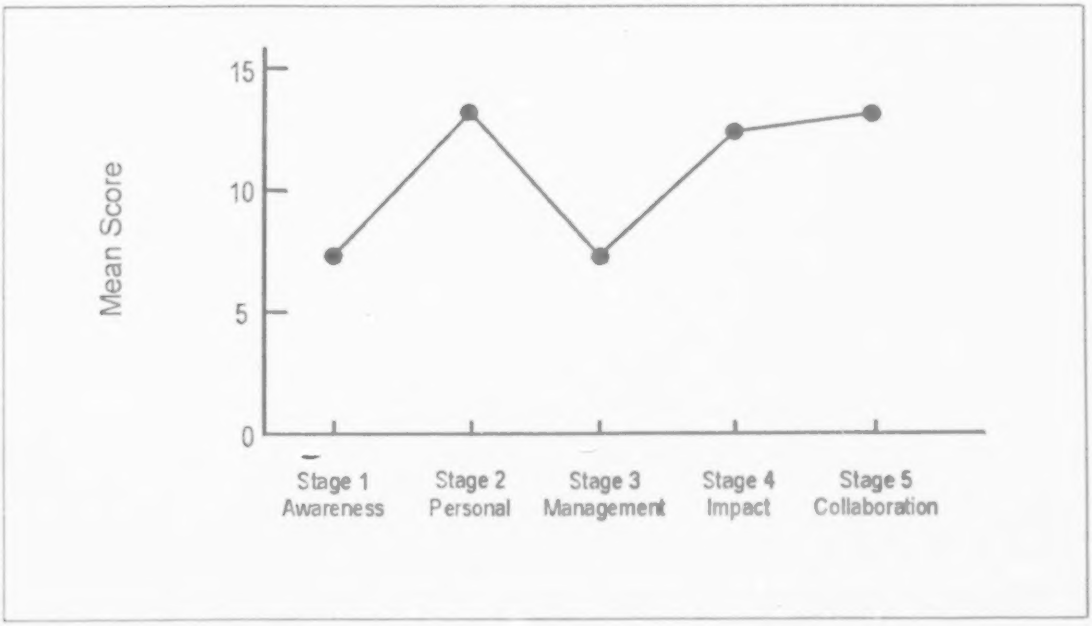
Concerns about moving to family-centered practices were determined by responses to the revised SoCQ (Bailey & Palsha, in press). Figure 3 shows the pattern of concerns for all subjects across the five stages. Relatively low levels of concern were expressed in Stage 1 (Awareness) and Stage 3 (Management), indicating that professionals felt they knew the fundamentals of family-centered services and were relatively unconcerned about how they would manage the implementation of family-centered care. Substantially higher levels of concern were expressed in Stage 2 (Personal), Stage 4 (Impact), and Stage 5 (Collaboration), indicating that professionals were concerned about the impact of this change on themselves, on the families and children served, and how they would work together with other team members in implementing a family-centered philosophy.

Interrelationships Among Measures

The relationships among the three measures were first examined using Pearson correlation coefficients. Self-ratings of family skills were significantly correlated with the perceived value of family roles, $r = .395$, $p < .0001$, although the shared variance accounted for was only 15.6%. The extent to which professionals valued family roles was not significantly correlated with the overall level of concerns (total score on the SoCQ) or with any of the five stages. Perceived skills in working with families was not correlated with total concerns; however, small but statistically significant relationships were found between ratings of family skills and stage-specific concerns: Stage 1 (Awareness), $r = -.23$, $p < .005$, and Stage 5 (Collaboration), $r = .20$, $p < .02$.

FIGURE 3

Stages of Concern Profile



To examine these relationships more specifically, we conducted two other analyses. First, two groups were created based on the Interventionist Descriptor Scale scores: High Family (top third, $n = 49$) and Low Family (bottom third, $n = 44$). Multivariate analysis of variance (MANOVA) procedures were used to determine if concerns varied as a function of high versus low valuing of roles with families. The overall Wilks' lambda was nonsignificant, $F = 1.38$, *df* 5,85, $p < .237$. Second, two groups were created based on self-ratings of skills: High Family Skills (highest third, $n = 48$) and Low Family Skills (lowest third, $n=49$). A MANOVA was used again to determine if concerns varied as a function of high versus low family skills. The overall Wilks' lambda was significant, $F = 2.53$, *df 5,89*, $p < .03$. The univariate tests revealed that professionals with low skill ratings tended to express higher concerns in Stage 1, $F = 7.00$, *df* 3,93, $p < .01$; Stage 2, $F = 3.80$, *df* 3,93, $p < .06$; and Stage 3, $F=3.62$. *df* 3,93.$p <.06$. Professionals with high skill ratings tended to express higher concerns in Stage 4, $F = 3.27$, *df* 3,93, $P < .07$, and Stage 5, $F = 8.54$, *df 3,93*, $p < .004$.

Other Variables Influencing Ratings

A final set of analyses was conducted to determine the extent to which ratings were influenced by experience, discipline, or job type.

Experience. To examine differences by experience, we divided the subjects into two groups, those who had worked less than 2 years ($n = 28$) and those with 5 or more years of experience ($n = 89$). Years of experience did not relate to concerns about family-centered services or the extent to which professionals valued family roles On the rating of skills and knowledge, professionals with a high degree of experience rated their child and team skills, but *not* family skills, higher than did professionals who had only recently begun to work, in early intervention.

Discipline To examine differences by discipline, we identified four groups of direct service providers: educators ($n = 28$) allied health professionals (physical therapists, occupational therapists, and speech-language pathologists, $n = 45$), social workers ($n = 21$), and nurses ($n = 14$). The MANOVA revealed an overall main effect for discipline in self-ratings of family skills, $F = 21.67$, df 7,100, $p < .0001$. Follow-up Tukey's tests revealed that social workers ($M = 4.24$) and nurses ($M = 3.82$) rated themselves significantly ($p < .05$) higher on family skills than did educators ($M = 3.23$) and allied health professionals ($M = 3.05$).

A main effect for discipline was also found in the perceived value of family roles. $F = 6.47$, *df* 7,100, $p < .0005$. Nurses ($M = 65.5\%$) are social workers ($M = 61.9\%$) endorsed more family roles than did educators ($M = 50\%$) or allied health professionals ($M = 47.5\%$). Tukey's comparisons indicated that all but the social work versus education comparisons were significant, $p < .05$.

A MANOVA procedure was used to determine if concerns varied as a function of discipline. Despite the significant discipline differences in skills and perceived value of family roles, no significant differences in concerns emerged as a function of discipline.

Job Type. A final set of analyses was conducted to see if direct service providers ($n = 89$) differed from those in administrative positions ($n = 25$) on any of the three measures. The two groups did not differ in the extent to which they endorsed family roles ($M = 56.6\%$ for administrators, and 54% for direct service providers). MANOVA procedures with the concerns data revealed no significant overall effect, Wilks' lambda $F = 1.59$, *df* 5,106, $p < .16$. To identify trends that might be useful in future studies, we conducted univariate comparisons. They revealed that direct service providers tended to express more Stage 4 (Impact) concerns, $F = 4.31$, *df* 3,110, $p < .04$, whereas administrators expressed more Stage 5 (Collaboration) concerns, $F = 3.94$, *df* 3,110, $p < .05$.

DISCUSSION

A primary purpose of this study was to describe the extent to which early intervention professionals in two states felt competent in working with families, endorsed family-oriented roles, and were concerned about changing to family-centered practices. Of additional interest were the relationships among those variables and the extent to which experience, discipline, and job type affected ratings. Findings from the study suggest a number of implications for personnel preparation activities.

Perceived Skills and Valued Roles

The professionals surveyed generally felt that roles associated with working with families were an important aspect of their work. As a group, they perceived themselves as moderately skilled in working with families; however, they felt more competent working with children. Significant differences in perceived skills and valued roles emerged as a function of discipline. Nurses and social workers endorsed more family roles than did educators and allied health professionals. They also rated their family skills as significantly higher than did educators and allied health professionals.

These findings are consistent with a recent survey of college and university programs across eight disciplines showing that social workers and nurses receive the greatest amount of preservice training related to working with families (Bailey, Simeonsson, Yoder, & Huntington, 1990). The results demonstrate the particular challenges that will be faced when professionals whose training is child focused are asked to become more family centered in their work. These professionals are likely to express lower sense of adequacy related to this role and thus may be less likely to value it than professionals whose preservice training has focused more extensively on families.

Because of the important relationship between perceived efficacy and implementation of innovative programs (e.g., Stein & Wang, 1988), several implications may be drawn from these findings. One is that preservice programs in education and allied health care may need to identify strategies for teaching skills related to working with families and for helping students develop an identity that includes work with families as a part of how they define themselves as professionals. Second, inservice training efforts will need to allow for the variability that is likely to exist in both skills and perceived roles and provide training activities accordingly. Finally, although all early interventionists should view work with families as part of their job, the specialized expertise of nurses and social workers, in this area provides a resource for service delivery, as well as for consultation and training of other team members.

Concerns

As a group, the respondents did not fit the classic profile of professionals just beginning to learn about an innovation (Hall & Loucks, 1978). Because many of them had been working in early intervention for some time and the movement to family-centered services has been emerging for several years, the respondents were already aware of many potential implications of these services. Participants in this study were primarily concerned about how changing to family-centered practices would affect them personally and whether their skills were adequate to meet this challenge. They were also concerned about how this change would affect the children and families they serve and how they would work together with other professionals to implement this change. Concerns did not differ as a function of discipline, although administrators were more concerned about collaboration and direct service providers were more concerned about impact.

Hall (1979) suggested that people who express a high degree of personal concern may view the change as a personal threat, a suggestion that is consistent with the finding that those professionals who viewed themselves as less competent expressed greater concerns in the initial stages. Hall suggested that inservice training for those who have intense personal concerns needs to encourage and build confidence, with an emphasis on a gradual implementation and assurances that personal support will be available.

Impact concerns relate to how the innovation might affect the clients being served. Common questions for early interventionists at this level might include: Will a family-centered approach reduce the quality of services for children? Will families want or benefit from this approach? Can I modify the approach to fit my own philosophy, or do I have to follow a single model? Hall (1979) suggested that people with impact concerns generally need little assistance because they have accepted the need for change and are now focused on its effects. This may not translate directly to family-centered services in early intervention, because high impact concerns may reflect a concern that shifting to family-centered services may come at a cost to the child. Training may be needed to help professionals see that a family-centered approach does not mean that children are ignored and ultimately should have the greatest benefit for children because of the supportive services that can be provided.

Hall (1979) reported that collaboration concerns are rare: in the present study, however, it was of primary concern for many professionals. This finding should not come as a surprise. Hall's work centered on innovations in schools, where teachers are involved primarily with implementation within their own classrooms, with their own students, independent of collaboration with fellow coworkers. P.L. 99-457, on the other hand, mandates a family focus carried out in the context of an interdisciplinary team, working in close collaboration to deliver services. This process can lead to uncertainty about the division of roles and responsibilities in working with families. Interdisciplinary collaboration, in fact, may be one of the more critical personnel preparation issues unique to implementing P.L. 99-457. When collaboration is of concern, inservice training activities are likely to be most effective if they include all team members and if the training is directly tied to the institutional context in which professionals work.

Interrelationships Among Measures

The data are consistent with other research suggesting that concerns, efficacy, and skills are relatively independent constructs. Moderate correlations would be expected and were found to be similar to those reported in other studies. For example, Guskey (1988) reported a correlation of .36 between ratings of personal efficacy and congruence of an expected change with current practices, a figure that is remarkably similar to our finding of a correlation of .395 between family skills and perceived importance of work with families. We also found a modest association between skills and concerns, but only in comparison of extreme (high versus low skills) groups. As would be expected, professionals with low family skills expressed more concerns in Stages 1-3, and professionals with high family skills expressed more concerns in Stages 4 and 5.

SUMMARY

The data from this study reinforce previous assertions that staff development activities have often failed to recognize that "trainees" approach proposed changes in practices with varying degrees of interest, skills, and concerns. As Stein and Wang (1988) reported, "Findings from the literature on social-psychological determinants of learning have consistently found an interactive relationship between success in learning, perceptions of self, and motivation" (p. 184). Although further research is needed to understand, the mechanisms by which these processes operate, training programs at the preservice and inservice level may need to examine the extent to which training practices are tied to individual needs and concerns and promote skills and values needed for effective work in early intervention. Such sensitivity to individual differences seems pertinent in the context of personnel preparation for roles to promote individualized services for families of young children with disabilities.

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The Effects of Family-Centered Service Coordination: A Social Validity Study

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This study examined if a family's level of satisfaction improves when the service coordination they receive adheres to a family-centered model. The participants included three service coordinators and nine families participating in Part H of IDEA. For 1 year, families reported what services they had received and their level of satisfaction with the services. A multiple-baseline design across subjects was used and an individual assistance condition was added when, following training, none of the service coordinators adequately implemented the model. Results indicate a high degree of family satisfaction and a low degree of dissatisfaction when the model was adequately implemented. In contrast, when the model was not adequately implemented, families reported very little satisfaction and a high degree of dissatisfaction.

Experts defining best practice in the field of early intervention advocate the adoption and implementation of a family-centered philosophy into all aspects of service delivery. The adoption of this philosophy, along with the implementation of the Individuals with Disabilities Education Act (IDEA; 1990*)*, Public Laws 99-457 and 102-119, has led to a significant change in the organization and delivery of services to infants, children, and their families. Part H of Public Laws 99-457 and 102-119 is the legislation that affects infants and toddlers birth through *2* years of age and requires states "to provide quality early intervention services to handicapped infants and toddlers and their families" (U.S. Congress, 1986, 100 STATUTE, 1145-1146*)*. Part H provides financial assistance to states to develop comprehensive, multidisciplinary systems of early intervention services for infants and toddlers from birth to 3 years of age who evidence developmental delay or, at a state's discretion, are deemed at-risk for developmental delay (U.S. Congress, 1986*)*. According to the Mental Health Law Project (1992), the Part H program recast federal policy by taking a family-centered approach.

Public Law 102-119 requires service coordinators to coordinate the delivery of Part H services across all agency lines and commands the recognition at the central role played by the family in the development of the individualized family service plan (IFSP). In Part H, service development, coordination, and monitoring are critical aspects of service coordination. As described by Zipper, Hinton, Weil, and Rounds (1993) the service coordination process extends from outreach and client identification, through assessment, resource identification, and development of the IFSP, to service implementation, monitoring, and evaluation of service outcomes. This broad definition of service coordination incorporates the multiple functions of case management. Zipper et al. (1993) maintain that it is impossible to implement effective service coordination without collaboratively involving the family in assessment, planning, and evaluation.

The fact that IDEA recommends a family-centered approach to the delivery of early intervention services has not necessarily led to the implementation of such an approach. In part, this may be due to a lack of evidence that families are better off when a family-centered approach has been used. In recent years several authors have identified the key elements of family-centered care (Edelman, Elsayed, & McGonigel, 1992; Johnson, Jeppson, & Redburn, 1992; National Center for Family-Centered Care, 1990*)*, have defined a family-centered model and practices (Dunst, Johanson, Trivette, & Hamby, 1991; Simeonsson, & Bailey, 1991), and have described methods for implementing a family-centered philosophy in early intervention practices (Bailey, McWilliam, & Winton, 1992*;* Barrera, 1991; Dunst, et al., 1991; Pearl, 1993). Lacking however, are data verifying that family-centered services and service coordination is somehow better than other types of service the family has received. The purpose of this study was to examine the effects of a family-centered service coordination model delivered to families with children, birth to 3 years age, who were participants in Part H of IDEA. Specifically, the study focused on whether a family's level of satisfaction improves when family-centered service coordination procedures are implemented.

METHOD

Participants

The participants consisted of three service coordinators and nine families (i.e., three families served by each of the three service coordinators).

Service coordinators. The three service coordinators worked with infants and toddlers with disabilities and their families in a large Southwestern city. Two were employed by a state agency and the third was employed by a community service provider that contracted with the state agency. All three had been employed as service coordinators for at least 1 year. The service coordinators were selected based on their experience, caseload, and willingness to commit to the 1-year study. Additionally, participation required that service coordinator's caseload include many families with an infant or toddler with disabilities. No incentives were offered or given to the service coordinators for participating in the study.

To identify potential service coordinator participants, the first author met with the district program manager for the state agency to discuss the study. Next, the program manager held a meeting with case management supervisors to obtain their support and recommendations. Supervisors then encouraged their case managers to participate but only two, Donna and Harriet, volunteered. The first author then asked for volunteers from community service providers. One individual, June, volunteered.

Donna had been employed by the state agency for the previous 6 years, and for the past 4 years she worked as a service coordinator for children birth to 3 years of age. She served families who participated in family and center-based programs, and those with children in foster care. Donna was Peruvian American, was bilingual (Spanish and English), and had a master's degree in social work. Throughout the study her caseload remained close to 60.

Harriet had been employed by the state agency for 4 years. During that time she worked as a service coordinator for school-aged children and for families with infants and toddlers in early intervention programs. The families with whom Harriet worked had children in family and center-based programs, foster care, and temporary residential nursing facilities. She was Hispanic American, was bilingual (Spanish and English), and had a bachelor's degree in child development and family relations. Although her caseload fluctuated throughout the study, it generally included 70 families.

June had been employed by a community service provider for 3 years. During that time, she worked as an early intervention specialist and as a service coordinator. She served families with infants and children in both family and center-based programs. June had studied music for 3 years at a state university and she had 5 years experience in the field of special education prior to her employment with the community service provider. She was Anglo. Throughout the study 40 families were on her caseload.

The service coordination activities to be performed by these individuals included (a) working with families to identify resources, priorities, and concerns; (b) coordinating initial, 6-month, and annual assessments and evaluations; (c) assisting families and their teams in developing and implementing IFSPs; (d) working with families to identify available services, as well as formal and informal support systems; (e) coordinating and monitoring service delivery; (f) providing information about community and advocacy, services; and (g) facilitating transitions to preschool services.

Families. Nine families, three of whom received services from each of the three service coordinators, participated in the study. Each family had at least one child birth to 3 years of age who received Part H services. Family composition and the disabilities represented in these families varied. Demographic information and family characteristics are shown in Table 1.

Requirements for participation by families consisted of the likelihood of remaining with the

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same program throughout the 1 year study, and accessibility by telephone. These inclusion criteria were used to limit the potential for transitions to other programs because, in this locale, when children transition from one program to another (e.g., from family-based to center-based), the service coordinator also changes. Inclusion criteria were explained to each service coordinator and they were asked for a list of families on their current caseload that met the criteria.

Thirty-seven families, representing 22% of their total caseload, were identified by the three service coordinators. Each of the 37 families was sent a letter of introduction, and invited to participate in the study: Twenty-two families expressed an interest in participating. Each of these families was sent a copy of the questionnaire and an appointment was made with the family to discuss the purpose of the study and their role as participants. Ten families were excluded because their child would transition from his or her current program prior to the end of the year. Of the remaining 12 families, 3 worked with Donna, 3 with Harriet, and 6 with June. The three participating families from June's caseload were selected randomly. No incentives were offered or given to the families for participating in the study.

Data Collection Instruments

Each month, every family responded to a set of questions designed to assess two areas: (a) the degree to which the service coordinator implemented a family-centered model (i.e., procedural reliability) and (b) the family's satisfaction with the service coordination they received during the previous month. Procedural reliability provided a measure of the degree to which the service coordinators actually implemented the procedures of the service coordination model on which they had been

TABLE 1.
Family Demographic Information on Ethnicity, Primary Respondent, Child's Impairment, and Family Living Arrangement

	DONNA (Peruvian American)	**HARRIET (Hispanic American)**	**JUNE (Anglo)**
FAMILY 1			
Ethnicity	Black American	Anglo	Hispanic American
Respondent	Mother	Mother	Mother
Child's Impairment	Down Syndrome	Multiply Impaired	Speech delays
Living Arrangement	Single mother of 1 child	Married parents of 1 child	Single mother of 2 children living wit her mother and siblings
FAMILY 2			
Ethnicity	Anglo	Hispanic American	Anglo
Respondent	Father	Mother	Mother
Child's Impairment	Multiply Impaired	Multiply Impaired	Speech delays
Living Arrangement	Married parents of 2 children	Single mother of 2 children and maternal grandmother	Married parents of 4 children
FAMILY 3			
Ethnicity	Anglo	Hispanic American	Hispanic American
Respondent	Mother	Mother	Mother
Child's Impairment	Speech delays	Multiply Impaired	Down Syndrome
Living Arrangement	Single mother of 3 living with her mother and 3 siblings	Unmarried couple of 1 child	Married parents of 4 children

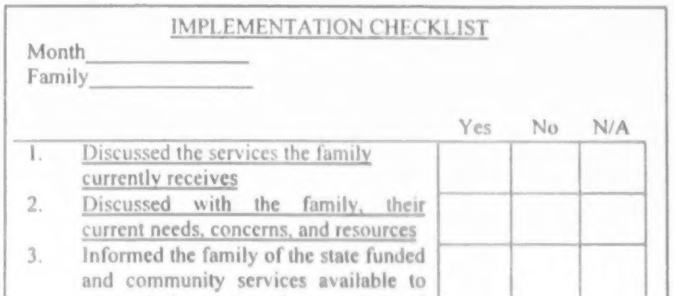
trained. Data on procedural reliability (Billingsley, White, & Munson, 1980) were considered crucial because it is not possible to determine the effects of family-centered service coordination unless one has evidence that the service coordination actually was provided. Throughout the entire study, data on procedural reliability were determined from the families' monthly responses on two different instruments: a checklist and a portion of a questionnaire. The purpose of the checklist was to record whether each service coordinator implemented the required procedures. The purpose of the questionnaire was to examine the service coordinators' actions during the delivery of services. Satisfaction data came from the families' monthly responses on the questionnaire.

Checklist. An implementation checklist (Figure 1) was used to document the services each family received during the previous month. The checklist consisted of 10 items, each of which corresponded to a particular component of family-centered service coordination. Four of the items addressed components that were required every month. The remaining six items were used only when a family requested additional services. Each item required either a yes, no, or not applicable response.

Service coordinators were required by the family-centered service coordination model to interact with each family on a monthly basis by telephone or home visit. During this interaction, each coordinator was to discuss the current services the family was receiving and the family's current needs, concerns, and resources. The coordinator was also required to review the outcomes written into the Action Plan section of the IFSP, and to update them as needed. Finally, information that would build on the family's knowledge of community resources and services was to be provided. Depending on a family's need, the service coordinator might also be required to inform the family of available services and assist them in obtaining those services.

Questionnaire. A family-centered paradigm was used to develop the research questionnaire. The defining characteristics of the paradigm were (a) incorporation of family support principles (Dunst et al., 1991), (b) family-centered intervention practices (Bailey et al., 1992; Edelman, 1991, Edelman et al., 1992), and (c) an enabling and empowering philosophy (Dunst, Trivette, & Deal, 1988). The questionnaire had three parts (see Appendix). The first part contained six questions that specifically addressed whether the service

FIGURE 1.
Implementation Checklist



IMPLEMENTATION CHECKLIST

Month______________
Family______________

		Yes	No	N/A
1.	Discussed the services the family currently receives			
2.	Discussed with the family, their current needs, concerns, and resources			
3.	Informed the family of the state funded and community services available to meet their expressed or generated needs			
4.	Explored with the family their informal support system and community resources to satisfy needs which cannot be covered by State funding			
5.	Responded to requests for services within three (3) working days			
6.	Contacted family to inform them of services provided (when provided) and the expected initiation date			
7.	Assisted in the development of the "Action Plan" and update as needed.			
8.	Reviewed progress on identified outcomes as written into the "Action Plan" and update as needed.			
9.	Provided information to build on family's knowledge (of community resources, etc.)			
10.	Linked the family with another source/resource who is best able to help them.			

(Numbers 1, 2, 8, and 9 are required monthly) coordinator informed the family of available services, involved the family in decision making, assisted the family in obtaining services, and respected the family's beliefs and values. For each item on the questionnaire, the family was asked to circle one of four descriptors that best described the interactions with their service coordinator during the previous month. Descriptors ranged from little or no interactions to interactions reflecting best practice. These questionnaire items served as a second measure of procedural reliability by validating the family's responses on the implementation checklist.

The second part of the questionnaire was a satisfaction index related to each of the six questions. Families were asked to indicate their level of satisfaction with the service coordination they received each month. The third portion of the questionnaire provided information not covered by the other satisfaction measures. Specifically, families indicated if the service coordination had been important to them, had facilitated their obtaining needed services, and had linked them with appropriate assistance.

Before beginning the study, an initial version of the questionnaire was pilot-tested for 6 months with six families with children birth to 3 years of age who were receiving Part H services. Based on their feedback, the questionnaire was modified and then reviewed by several experts in the field who suggested additional modifications. The final questionnaire (see Appendix) was pilot-tested again for 6 months with 10 new families.

Calculation of Procedural Reliability

The checklist was used as the primary measure of how well the participating service coordinators implemented the family-centered service coordination procedures they had been taught. Each month, procedural reliability was calculated by dividing the number of components the service coordinator implemented by the total number of components that should have been implemented. This always included the four required components and any other items for which a family had indicated a need. For example, during a particular month, a family might have required assistance securing a service, thus the necessary checklist items were 1, 2, 3, 4, 5, 6, 8, 9, and 10. If the family indicated the service coordinator implemented all needed items except number 10, procedural reliability was calculated by dividing the number of items the service coordinator implemented (8) by the total number required that month (9) resulting in a procedural reliability of 89%. Procedural reliability of 85% or greater was accepted as adequate implementation of family-centered service coordination. This percentage was selected because it indicated a high degree of compliance without requiring absolute perfection. When procedural reliability on the checklist was 85% or greater, the probability was 99% that the questionnaire rating would be acceptable to exemplary. When procedural reliability on the checklist was less than 85%, the probability of an inadequate rating on the questionnaire was 97%. Thus, procedural reliability of 85% or higher on the checklist corresponded very highly with the behavior required by the family-centered model.

Design

A multiple baseline across subjects design was used. In this design the effects of an intervention (i.e., family-centered service coordination) are evaluated by introducing the intervention to different subjects (i.e., Donna, Harriet, and June) at different points in time (i.e., October, November, December). The design included three conditions: baseline, post training, and individual assistance. Each subject started with baseline for 3 or more months. During baseline each subject provided service coordination as she previously had been doing. As a coordinator completed the baseline phase she was immediately provided training in the family-centered model so she could implement this intervention with her target families. Following training, the coordinator entered the post training phase. The individual assistance phase was added because none of the service coordinators achieved procedural reliability of 85% or greater with all three families during the post training phase. The individual assistance phase began during different months for each service coordinator and was in a sequence different from that used for training.

For Donna, the baseline phase lasted 3 months, post training began in Month 4, and the individual assistance phase started in Month 9. Harriet remained in baseline phase for 4 months; post training started in Month 5, and the individual assistance phase started in Month 11. For June, the baseline phase lasted 5 months, post training started in the 6th month, and the individual assistance phase started in the 8th month.

Procedure

Baseline. During the baseline phase the service coordinators continued to provide services to the participating families using whatever methods of service delivery they had previously used (e.g., professional-centered, child-centered, combinations of models). During this time the first author contacted parents who indicated an interest in the study to explain the study and the role of participants. Baseline data were collected during these visits and queries regarding questionnaire responses were answered. Discrepancies between possible responses and actual coordinator behavior were discussed and the families were then asked to choose the descriptor that best fit their service coordinators' behavior. Parents also were asked to decide how they would like to arrange future contacts with the researcher. Preferences ranged from telephone contacts to home visits. During the remaining monthly contacts, the first author read the questions and responses to the parent, and the parent indicated his or her response. Families had a reference copy of the questionnaire to use during these contacts. Notes of all discussions and queries were written on the questionnaire for reference and clarification. For each family the same parent responded to the checklist and the questionnaire items each month.

Training component. Training was conducted by the first author in a multi-purpose room at a local social service agency. Each 1-day training session lasted 6 hours and involved at least four professionals (i.e., one of the service coordinators and at least three other professionals not otherwise involved in the study). Additional, individual interactions between the first author and the participating service coordinators occurred over the telephone, in their offices, and in other community settings. All meetings were scheduled and held at a time and location convenient for the service coordinator. The training day for each participant was held during the 1st week of the month during which the service coordinator was to enter the post training phase. Baseline data for the previous month were collected prior to training.

Project Copernicus, a Train-the-Trainer Series in Family-Centered Service Delivery was used as a prototype for developing the training component. This training program focuses on three areas: (a) building parent professional collaboration (Edelman, Greenland, & Mills, 1992a), (b) family-centered communication skills (Edelman, Greenland, & Mills, 1992b), and (c) overview of family-centered service coordination (Edelman, et al., 1992). The 6-hour training program covered the following topics (a) recognizing family-centered care, (b) elements of family-centered service coordination, (c) active listening skills, (d) family-centered communication skills, (e) family and professional collaboration, and (f) service coordination roles and activities. Because the participating service coordinators were trained in different months, Project Copernicus activities were re-structured to provide small group training activities.

Post training phase. Immediately following each 6-hour training an additional 2 hours was spent with each service coordinator delineating the procedures to be followed throughout the post training phase. At this time the names of the three participating families were given to each service coordinator. The coordinators were also given a service coordinator log in which to record their monthly contacts with each family. Service coordinators were expected to record the following information in their logs (a) date and type of contact (e.g., home visit, evaluation, telephone, written), (b) concerns and needs expressed by the family, (c) date she responded to the family's request, and (d) barriers experienced when implementing the model. Discrepancies between the service coordinators' logs and parent responses were discussed with both the service coordinator and the family, however, these discussions did not result in any changes in parent responses.

Individual assistance phase. This phase was established because the procedural reliability data indicated that none of the service coordinators adequately implemented the training they had received. The focus of this phase was on providing individual assistance to each service coordinator so she would successfully implement the required procedures. June moved into the individual assistance phase first because her procedural reliability after training was 85% or greater with two of the three families. A 2-hour meeting was held with her to determine the barriers she encountered in implementing the required procedures. June requested assistance in clarifying components of the program and help with implementing the components. Organizational skills needed to accomplish service coordination tasks within 3 days were reviewed and additional service coordinator logs were provided. June admitted that she had forgotten about the third family participating in the study and had misplaced her logs. Although monthly contact continued, June did not require further assistance and she achieved 85% or greater reliability with all three families for the duration of the study.

Donna moved into the individual assistance phase next. A discussion of barriers to implementing the required procedures revealed Donna's personal dissatisfaction with the lack of support she received at work. Limited clerical help, staff turnover rate, low pay, and a lack of trust between co-workers were initially described as barriers to implementation. After further discussion, Donna conceded that she was no longer following the post training procedures because she had difficulty contacting the families during work hours and had poor relationships with these families. This lack of timely follow through further hampered implementing the procedures. The program components were clarified for Donna, and alternative ways of contacting families (e.g., using her pager) and working with families (e.g., showing more interest in them) were discussed. Donna did not achieve adequate reliability with any of the three families after the initial 2-hour meeting thus an additional 1-hour follow up was provided. Donna achieved 85% or greater reliability with all three families for one month, however, she did not maintain this level of procedural reliability. Follow up included telephone discussions of previously identified barriers to implementing the procedures and any new barriers she was experiencing.

Harriet was the last service coordinator to transition into the individual assistance phase. Barriers identified by Harriet during a 90-minute meeting included her large caseload, her ongoing relationship or lack thereof with the families, and her expectations of the families. Harriet firmly believed that if a family needed her help they would contact her regardless of whether they had ever met her before their need arose. Follow-up telephone conversations continued throughout the final 2 months of the study, but Harriet achieved adequate procedural reliability with only one of her families.

RESULTS

This section reports results of family satisfaction related to implementation of the family-centered model of service coordination. The term implementation is used here to refer to those months in which a service coordinator achieved procedural reliability of 85% or greater. The term non-implementation is used to refer to those months in which a service coordinator failed to achieve procedural reliability of at least 85%.

To assess the variability among the six satisfaction ratings given by each family each month, an analysis was made between the rating given to questionnaire Item 1 and to those given to Items 2-6. The purpose of this analysis was to determine whether families tended to report the same degree of satisfaction across all six questionnaire items each month. For example, if the response by Family 1 to Question 1 in the 1st month was, not satisfied, what was the probability that the other questions were given the same rating that month? This analysis revealed a 93% probability that the ratings given to Questions 2-6 were identical to that given to Question 1, regardless of whether the response was not satisfied, nearly satisfied, or satisfied. Therefore, the results presented in Figure 2 pertain only to Questionnaire Item 1 and are presented as an example of the responses given across Questionnaire Items 1-6. Data on Items 7-9, which were summative measures, are presented separately.

Table 2.
Percentage of Time Families Indicated Satisfaction With Services When the Model was Implemented (i.e., Procedural Reliability (85%) or Not Implemented (i.e. Procedural Reliability < 85%).

Level of Satisfaction	With Implementation	Without Implementation
Satisfied	76	1
Nearly Satisfied	22	14
Not Satisfied	2	85

In Figure 2, arrows indicate the months during the post-training and individual assistance phases when the service coordinator achieved procedural reliability of 85% or greater on the Checklist. Table 2 shows the responses given by families indicating satisfaction or dissatisfaction with the services they received during the post training and individual assistance phases when the service coordinators implemented the model. Seventy-six percent of the responses (given by each family each month) indicated satisfaction and only 2% indicated dissatisfaction. In contrast, when the model was not implemented, only 1% of the responses (given by each family each month) indicated satisfaction and 85% indicated dissatisfaction. Ratings of nearly satisfied were given on 22% of the responses (given by each family each month) when the model was implemented, compared with 14% when the model was not implemented. It is important to note that contact alone did not result in improved levels of satisfaction. During all three phases of the study, the service coordinators often contacted a family but failed to follow through on the other required components of the model. When this occurred, the family was always dissatisfied. These results suggest that it was the nature of the contact, (e.g., respectful approach, consideration of family priorities) and the services provided that resulted in higher satisfaction ratings.

Questionnaire items 7-9 required a yes or no response. Table 3 reflects parent opinion as to the importance and benefits derived from the service coordination, development of formal and informal supports, and building interdependencies between the community and the family. Question 7 asked whether the service coordinator provided an important service for the family. With implementation of the model, there was 93% agreement; without implementation, there was only 13% agreement. Question 8 asked whether the information the families received from their coordinator allowed them to seek assistance from other agencies without the coordinator's assistance. With implementation, there was 69% agreement; without implementation, there was only 1% agreement. Question 9 asked whether the service coordinator helped connect the family with individuals who were best able to help them (e.g., parent support group, state and federal assistance, O.T., P.T.). With implementation there was 93% agreement, without implementation there was only 8% agreement.

DISCUSSION

The results of this study clearly indicate that when the service coordinators adequately

Figure 2 Monthly satisfaction ratings by family across all conditions

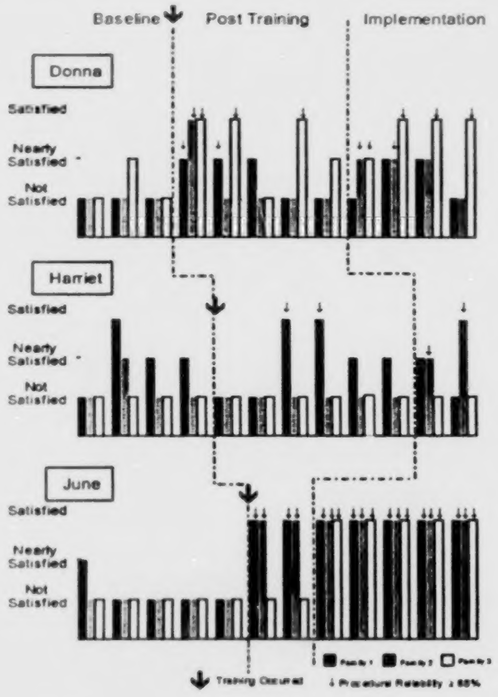


TABLE 3.
Percentage of Agreement with Implementation and Without Implementation with Each Family Each Month.

Question	With Implementation	Without Implementation
7. Importance of service	93	13
8. Mobilizing resources and supports	69	1
9. Enhancing sense of community	93	8

implemented the family-centered model, families reported a high degree of satisfaction and a low degree of dissatisfaction. In contrast, when they did not adequately implement the model, families reported very little satisfaction and a high degree of dissatisfaction. This relationship occurred consistently with all three service coordinators throughout the post training and the individual assistance phases.

Since the early 1990s, the early intervention literature has included numerous descriptions of family-centered philosophy, of values, of service approaches, of intervention policy and practice, of training procedures, and of models. Millions of dollars have been spent on training and disseminating information on the family-centered approach to audiences including early intervention personnel, community service providers, families, pre-school special education personnel, and legislators. Furthermore, the field has collectively agreed that a family-centered approach constitutes best practice. Perhaps most interesting is the fact that all of this has occurred in the absence of data that support the approach. Fortunately, the results of this study support the direction the field has taken.

An interesting feature of this study is that it examined the impact of service delivery on those who received services. In fact, service recipients (the families) provided all of the data that were collected in this study. In contrast, most research on service coordination has focused on the service coordinator. For example, surveys of service coordinators have identified attitudes (Middleton, 1985; Rubin & Johnson, 1982), described issues related to implementing services (Middleton, 1985), and explored time allocation (Kurtz, Bagarozzi, & Polane, 1984; MacEachron, Pensky, & Hawes, 1986; Wright, Skelbar, & Heiman, 1987). Although a few studies have attempted to examine the effects of service coordination on recipients and have suggested that recipients benefit from the services they receive (Baker & Weiss, 1984; Rapp & Chamberlain, 1985; Zimmerman, 1987), these studies have been criticized on methodological grounds (Bailey, 1989) because they failed to use acceptable research designs.

Although training programs are continually being developed and implemented, results from this study raise questions about the impact of such training. One cannot assume that individuals will implement the training they receive. Despite intensive, individualized training using nationally recognized training materials, the service coordinators in this study did not initially implement the model as designed. Although millions of dollars are being spent annually to train early intervention professionals and paraprofessionals, there is some reason to question whether training in best practice actually enables personnel to implement best practice.

The findings of this study are limited to the three service coordinators and nine families that participated. Caseloads for the three service coordinators during the study ranged from 40 to 70 families. One should not infer that the results generalized to these service coordinators' entire caseloads. Likewise, the effects of caseload size on the implementation of the family-centered model cannot be determined. This study does, however, provide information that may help determine the variables (e.g., family needs for services, clerical and administrative support) that could be used to determine reasonable caseload sizes. Although each service coordinator was asked to implement the model with only three families, it is interesting to note that the one with the lowest caseload consistently achieved procedural reliability with all of her families during the individual assistance phase. Conversely, the service coordinator with the highest caseload achieved procedural reliability with only one family during the individual assistance phase. Limited caseloads do not ensure the provision of quality services, but the implementation of a family-centered approach into all aspects of service delivery becomes more tenable.

Participation by the nine families and the three service coordinators was voluntary. No incentives were given to the families or the service coordinators. Self selection by the service coordinators did not necessarily result in implementation of the model. The service coordinators' belief systems, organizational skills, and organizational support systems were a few of the factors that influenced their implementation. Furthermore, it is not known whether similar results would occur with a randomized selection of service coordinators and families.

This study looked only at the implementation of this model; it did not consider other demands made on the service coordinators. For example, service coordinators are expected to integrate differing service systems (e.g., health and education), provide for high quality services, maintain cost-effectiveness, and satisfy the demands made by superiors. None of these factors was considered in this study. The individualized support given to service coordinators to improve their implementation of the model did not provide sufficient information on the variety of supports that might be needed by service coordinators to enable them to implement the model consistently over time. Supports provided during the individual assistance phase were based on the individual identification of the barriers each service coordinator encountered when attempting to implement the model. The specific barriers that other service coordinators might encounter could be quite different.

One alternate explanation for our findings is that when caseloads are too high for service coordinators to address the needs of each family, any intervention that affects individualized attention will be far more satisfactory. It is important to note, however, that contact alone did not result in improved levels of satisfaction during any of the three phases of the study. During all three phases, the service coordinators often contacted a family but failed to follow through on the other required components. When this occurred, the family was always dissatisfied. These results suggest that the quality of the interaction was more important than the interaction itself.

The results of this study suggest the need for considerable further research. First, it is necessary to replicate the study to include the full caseloads of early intervention service coordinators. In conjunction with this replication, it would be important to analyze the supports (e.g., administrative, technical, emotional) required to help service coordinators implement a family-centered model.

Second, research is needed on the effects of a family-centered service coordination model on the service coordinator. Social validity (Wolf, 1978) is used to assess the social significance of potentially relevant goals, procedures, or effects. It has provided a critical measure of the social impact and importance of intervention in applied behavior analysis since the mid-1970s (Kennedy, 1992). The current study demonstrated good social validity for families by documenting the high degree of satisfaction that occurred when the family-centered model was implemented. If service coordinators are expected to implement a family-centered model, it is important to consider the social validity of this model not only for the service recipients, but for the service coordinators as well.

Third, research is needed on the impact of training on implementation. In this study, training alone did not lead to adequate implementation. This finding is significant for all educators and trainers in all situations in which the expected outcome of training is implementation. Therefore, methods of training and follow-up that result in the implementation of training components need to be studied further. Extensive training and follow-up, however, may not result in the implementation of a family-centered approach in the delivery of services to families. For example, Harriet was unwilling to alter her personal beliefs toward individual families and took a strict approach to delivering services to these families. Her desire to maintain personal control, not caseload size, contributed to her lack of success in implementing the model with the three participating families. Although she volunteered for the research project, she made few attempts to follow the model as described.

Finally, there is a need for research on the social validity of best practice in early intervention. Only through such studies will we be able to determine the importance, value, and impact of early intervention practice on those receiving services and to those providing services.

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APPENDIX

QUESTIONNAIRE
THE EFFECTS OF FAMILY CENTERED SERVICE COORDINATION

TO ANSWER THE FOLLOWING QUESTIONS, USE THE "QUESTIONNAIRE CRITERIA" PROVIDED. CIRCLE THE LETTER THAT BEST DESCRIBES YOUR RESPONSE FOR EACH MONTH.

1.1 We are informed, by (Name), of the services that are available to us.

A: (Name) has not communicated with us this month (via letter, telephone, or home visit) regarding services.

B: (Name) has asked questions and/or given information only about those services we are currently receiving.

C: (Name) has informed our family of additional services and has explained the services to us.

D: (Name) has reviewed all the services available to our family and has answered all of our questions regarding the appropriateness and availability of the services.

1.2 How satisfied are you with this level of service?
(Does this meet your needs; Are you pleased?)

Satisfied   Nearly Satisfied   Not Satisfied

2.1 (Name) involves us in making decisions about the services we receive.

A: (Name) has not communicated with us this month.

B: (Name) may share some information on the services we can receive and may or may not tell us about the changes in services when they occur.

C: (Name) shares information on services we can receive and may or may not involve us in making decisions regarding the amount, level, and duration of services.

D: (Name) ensures that we have all the information we need to make the best, most informed decisions about services for our child and family, and regularly shares information about services and changes in services. We decide the amount, level, and duration of these services, and our level of participation.

2.2 How satisfied are you with this level of service? (Does this meet your needs; Are you pleased?)

Satisfied   Nearly Satisfied   Not Satisfied

3.1 We play a major role in deciding which resources and support we need and would like to receive.

A: (Name) has not communicated with us this month.

B: (Name) decides when we need a particular service, then tells us about it (eg: evaluations, alternative programs).

C: (Name) tells us we may be entitled to a service after we have expressed a need in that area. We may or may not receive the service.

D: After (Name) informs us of all the services available to us, we determine what we need based on our priorities, resources and concerns. We discuss community and family resources and the ability of state funded programs to pay for services. We work together to obtain the services we need.

**3.2 How satisfied are you with this level of service?
(Does this meet your needs; Are you pleased?)**

Satisfied Nearly Satisfied Not Satisfied

4.1 We are receiving the services we feel are needed for our family.

A: We are unable to discuss our needs with (Name); she has not communicated with us this month.
B: We still receive essentially the same services.
C: (Name) has talked with us about our priorities and concerns, has told us what services we can receive, and has or has not obtained them for us.
D: (Name) has informed us of all services that are available and has helped us identify our resources, priorities and concerns. We are now receiving the services we requested at the time and place that is best for us.

**4.2 How satisfied are you with this level of service?
(Does this meet your needs; Are you pleased)?**

Satisfied Nearly Satisfied Not Satisfied

5.1 (Name) understands the decisions we make as a family.

A: (Name) has not contacted us this month and therefore, cannot understand the types of decisions we need to make.
B: (Name) is critical of the decisions we make.
C: For the most part, (Name) does judge us or the decisions we make.
D: (Name) does not judge us or the decisions we make whether or not she understands them. She supports us and advocates for our needs.

**5.2 How satisfied are you with this level of service?
(Does it meet your needs; Are you pleased?)**

Satisfied Nearly Satisfied Not Satisfied

6.1 The service coordination/case management we receive respects our family's personal and cultural beliefs and values.

A: (Name) has not maintained regular contact with us so we do not know whether she respects our families' beliefs and values.
B: (Name) has maintained contact with us but does not consider or respect us and our lifestyle, beliefs, and values.
C: (Name) appears to respect each member of our family and considers our personal and cultural beliefs and values.
D: We know through experience that (Name) respects each member of our family, advocates for us, and protects our rights under the DDD system.

6.2 How satisfied are you with this level of service? (Does it meet your needs; Are you pleased)?

Satisfied Nearly Satisfied Not Satisfied

PLEASE CIRCLE "YES" OR "NO" IN RESPONSE TO EACH QUESTION AS IT PERTAINS TO EACH MONTH.

7. **(Name) provided an important service for our family.**
YES NO

8. **The information we received from (Name) allows us to seek assistance from other agencies with depending on her for help.**
YES NO

9. **(Name) linked our family with those individuals who are best able to help our family (eg: Lekotec, WIC, Food Stamps, Parent Support Groups).**
YES NO

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How Responsive Is Early Intervention to the Priorities and Needs of Families?

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This study assessed the type and scope of services provided to families participating in early intervention programs and examined whether early intervention services were responsive to families' concerns. From 63 programs, 357 mothers responded to a printed questionnaire. Results indicated that (a) early intervention programs provided significantly higher levels of family services related to child information, family instructional activities, and systems engagement as compared to personal/family and resource assistance; (b) services were rated more favorably in home-based programs and center-based programs with home-based components than in programs with only center-based services; (c) the services families reported receiving were positively correlated with their ratings of the desirability of services; (d) families' needs for services were significantly higher than the level of services they reported currently receiving; and (e) the types of services families received depended in part on the location in which they resided. No significant relationships were found between characteristics of children and the types of services families received. However, the pattern of relationships between family characteristics and family services suggested that families with optimal patterns of family functioning were more likely to receive services than were families with indicators of risk or dysfunction.

Perhaps the greatest change to have occurred in early intervention practice services over the past 20 years is the way that programs have conceptualized their relationships with parents and families. Parent and family involvement has long been considered critical to the success of early intervention. Yet, with the inception of the Part H program (P.L. 99-457, Education of the Handicapped Act Amendments of 1986, reauthorized in 1991 as the Individuals with Disabilities Education Act of 1990 [IDEA]), there have been radical reformulations regarding both the scope of family services considered appropriate for early intervention and conceptualizations about the manner that service providers should interact with parents (Krauss, 1990; McBride, Brotherson, Joanning, Whiddon, & Demmitt, 1993; Raab, Davis, & Trepanier, 1993).

Early efforts to involve parents in early intervention were dominated by a clinically oriented educational and therapeutic service model. In this model, the focus of early intervention was the specialized instructional and therapeutic activities that professionals provided to address children's learning and developmental needs (Foley, Hochman, & Miller, 1994). This professionally driven model viewed children's success in early intervention as contingent upon their exposure to, and participation in, the specialized activities and experiences that took place in clinical settings. In what is referred to as the "family-allied model" (Dunst, Johanson, Trivette, & Hamby, 1991), professionals invited parents to participate in this process by asking them to create conditions and implement activities at home that replicated and supported clinical intervention activities. Seldom were recommendations made with any consideration about how these activities could be integrated into the home, or of the adequacy of existing family conditions for supporting and encouraging the desired outcomes.

Contemporary family-centered early intervention service models have been shifting the focus of services from therapeutic or educational activities to an emphasis on enhancing and supporting the effectiveness of families caring for their children (McBride et al., 1993). This emphasis has evolved for a number of reasons: the limited success of parent-assisted models for promoting parent participation; changing theories about the role of parents and families in children's development; increasing awareness of the complex family issues surrounding the care of children with disabilities; and heightened sensitivity to the moral and legal rights of parents to be treated as full partners in all decisions and activities carried out on behalf of their children (Dunst et al., 1991; Dunst, Trivette, & Deal, 1988; Florian & Greig, 1993).

Reflecting this family-centered model, federal early intervention legislation was developed to promote three goals for parent and family involvement (Smith, 1988; Trohanis, 1989). The first was for the scope of family services to be broadened to include the full range of services needed to help parents adjust and cope with the stressors and demands associated with raising children with disabilities. Part H recommendations extended early intervention services beyond traditional educational and therapeutic activities to include a comprehensive array of financial, social, psychological, and other family support services that would be responsive to parent and family needs associated with the care of their children.

The second goal was for parents to become fully involved in the planning of early intervention services. Individualized Family Service Plans (IFSPs) were required to include service outcomes for both children and families (McGonigel, Kaufman, & Johnson, 1991). Parents and professionals were encouraged to develop these outcomes collaboratively, but the outcomes listed on the IFSP were to reflect the priorities and concerns of parents rather than the preferences of professionals.

The third goal was for parents to be considered as full partners in the early intervention process. An underlying assumption of Part H is that the developmental outcomes that children attain ultimately depend upon the effectiveness of parents, as opposed to professionals, in managing and caring for their child. Although the law does not intend that parents become primary interventionists for their children, it does promote a service climate in which providers are encouraged to work collaboratively with parents to promote the integration of instructional and therapeutic activities into the child's environment (Bailey, 1989; Trohanis, 1989).

Since the passage of Part H legislation, the professional community has been highly supportive of expanding family services and giving parents a more prominent role in the identification and planning process (Dunst et al., 1988). Yet, the challenge of fully meeting the family service goals of this legislation is significant, particularly in light of the fact that this legislation represents a substantial shift from the types of early intervention services provided in many programs prior to the inception of the law. For example, a 1987 survey of early interventionists from the state of Connecticut (Mahoney, O'Sullivan, & Fors, 1989) indicated that early interventionists spent only 10% of their service time working directly with families. Almost one half of the respondents reported spending less than 15 minutes per week with each of the families they served. The limited collaborative activities that took place between early interventionists and parents were related partly to service providers conceptualizing early intervention as child directed, clinical services, as well as to the fact that providers had little, if any, training and procedural guidelines for working with families.

The purpose of this study was to examine the status of early intervention programs with regard to the manner in which they worked with parents and families 4 years after the passage of part H legislation. The study was concerned with two issues: (a) to identify the type and scope of services being provided to parents, and (b) to determine whether services were responsive to family needs and priorities. The Family Focused Intervention Scale (FFIS) was used in previous studies to assess mothers' perceptions of the family service orientation of early intervention programs (Mahoney, O'Sullivan, & Dennebaum, 1990). In the present study, this scale was used to identify the extent to which early intervention programs were directing their services toward family-level concerns, and whether these efforts reflected a clinical educational model or a broader based, comprehensive family service model. Family needs were assessed with two procedures. The first was to determine the extent to which parents perceived various family services to be desirable and important. The second was to assess characteristics of families that are commonly assumed to be indicators of family needs (McNaughton, 1994), including the age of the child, severity of the child's disability, and age of the parents. Specifically, we wanted to know whether the type and intensity of services families received corresponded to family characteristics indicative of the greatest levels of need. If early intervention services are truly responsive to family concerns and priorities, the services that parents receive should be determined less by serendipitous factors such as the locality parents live in, and more by the characteristics of families and children that logically require greater levels of assistance and support.

Method

Design

A questionnaire was designed to accomplish three purposes. The first was to determine parents' level of participation in early intervention and the types of family services they received from these programs. The second was to determine the extent to which the services parents reported receiving from their programs were actually responsive to their needs. The third was to collect information about child and family characteristics that may affect families' level of participation in early intervention services (McNaughton, 1994).

To assess family participation in early intervention, respondents answered six items regarding their frequency of participation in early intervention. These items included questions about the length of time they participated in early intervention; the number of center-based activities they attend each month as well as how many they *would like* to attend; the number of home visits they receive each month as well as how many home visits they *would like* to receive; and where they receive early intervention services: home, center, or a combination.

Participants also rated the extent to which they received 39 family services identified on the FFIS. Respondents' ratings of these services were used to estimate intervention program activities across five different categories: (1) *systems engagement*-activities that help parents and others become involved in community-based services; (2) *child information*-information about children's health and disability and developmental status as well as the rationale for services; (3*) instructional activities*-suggestions that help families address the developmental concerns of the child at home; (4) *personal and family assistance*-counseling and other types of social activities to help the family cope more effectively with the stress associated with caring for their children; and (5) *resource assistance*-services to help families obtain financial, medical, respite, and other community services needed to address the daily care of their children.

Two procedures were used to assess the responsiveness of intervention programs to the needs of parents. First, respondents rated each of the family services listed on the FFIS in terms of relative importance. *Importance* was defined as the extent to which respondents *themselves* would *want* to receive these services. Second, characteristics of families and children that are generally assumed to be the targets for family-focused services were assessed.

An abridged version of the Family Environment Scale (FES; Moos & Moos, 1986) was used to assess features of family functioning that may be affected directly by raising young children with disabilities, or be indicators of problems that could lead to family crises. Five-item versions of the Cohesion, Expressiveness, Control, and Active/Recreational subscales were used because multiple regression analyses of FES data collected from a previous study (Mahoney, O'Sullivan, & Robinson, 1992) indicated that responses to these items predicted at least 85% of the variance of full subscale scores. In the Mahoney et al. study, the FES was expanded from a true/false response scale to a 6-point Likert scale ranging from 1 (*never*) to 6 (*always*). This change in response strategy was used to obtain a range of scores necessary for regression analysis. Respondents were asked to respond to statements as they applied to their family. In addition, 18 items from the Family Resource Scale (FRS; Dunst et al., 1988) were used to assess respondents' perception of the adequacy of resources, including time, money, childcare, and physical support for addressing the needs of the family as a whole as well as individual family members. Mothers responded to statements on a Likert scale ranging from 1 (*not at all adequate*) to 5 (*almost always adequate*) in meeting the needs of the family. Reliability and validity on the original 31 items of the FRS were established in a study with 45 mothers of children with disabilities. Coefficient alpha was .92. Test-retest correlations coefficient was $r = .52$ ($p < .001$) when administration of the survey was 2 to 3 months apart (Dunst et al., 1988).

Respondents answered 20 additional close-ended items regarding child and family characteristics that are likely to affect family participation in social service systems. These items measured parents' educational level, work status, family structure (e.g., family integrity, number and ages of other children), and the developmental status of their child with disabilities.

A preliminary version of the questionnaire was reviewed by Part H representatives from four of the five states that participated in this project. These professionals eliminated or modified items that could be construed as either offensive or potentially harmful to respondents. They also made recommendations to include items that more accurately reflected the philosophy and scope of services in their states. The final questionnaire form consisted of 145 closed-ended questions that took 30 to 45 minutes to complete.

Sampling Procedures

This study was part of a larger study that required researchers to visit participating sites; therefore, the selection of states was based on geographic closeness to the researchers. Program administrators identified from state rosters of early intervention programs from five southeastern states (North Carolina, South Carolina, Virginia, Florida, Georgia) were contacted by phone to determine their willingness to participate in this study. An exhaustive effort was made to contact all program administrators in North Carolina, South Carolina, and Virginia. An effort was made to contact all programs through north central Florida (the panhandle down to Orlando). Administrators in Georgia were contacted in an effort to increase the sample size. Those who consented to participate were mailed two sealed parent questionnaire packets for each of the service providers working in their programs. Service providers were instructed to distribute these packets to two parents who were representative of parents from their caseloads. A total of 700 questionnaires were distributed in this manner. A cover letter enclosed in this packet asked mothers to complete the survey and return it directly to the project coordinator. Information identifying respondents was not requested on the questionnaire.

Parent questionnaires were distributed in the spring of 1992 and received by project coordinator through the following November. Of the 700 parent questionnaires distributed, 422 were returned, representing a return rate of 60%. Of them, 22 (5%) were eliminated from this analysis due to incomplete responses, and 43 (10%,) were dropped because the children were older than 36 months of age. Thus, 357 questionnaires, 51% of the total mailed, were available for analysis.

Results

Sample Characteristics

Characteristics of the respondents and their children with disabilities are reported in Table 1. The majority of the respondents were biological mothers (91%), White (82.5%), and at least high school graduates (86.8%). Almost 60% of the respondents reported staying at home full time with their children. Their children with disabilities were an average age of 20.7 months and had been participating in early intervention for approximately 12 months. Although the average age for children to begin early intervention was 9.3 months, only slightly more than one half of these children (52.3%) were identified as having significant development delays as reported by mothers. An additional 28% of mothers reported their children to be average or above average in their developmental status. Respondents came from 63 early intervention programs from five southeastern states. Early intervention services were provided through a variety of service options including home-based (41.8%, center-based (35%), and center-based with home component (23.2%).

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Table 1. Characteristics of Respondents and Their Children

Characteristics	N	%	M	SD
Respondent relationship with child	357			
Biological mother		91.0		
Step/adoptive mother		2.8		
Guardian/foster mother		4.5		
Relative		1.7		
Marital Status	354			
Married		80.1		
Divorced		3.4		
Separated		5.3		
Never Married		10.7		
Mother's age (average years)	357		31.4	7.0
Father's age (average years)	303		33.7	7.4
Mother's education (average years)	355		13.7	2.6
Less than high school		13.2		
High school graduate		31.9		
Partial college/technical training		21.9		
College graduate		8.4		
Graduate degree		13.5		
Father's education (average years)	302		14.2	3.0
Less than high school		10.9		
High school graduate		31.5		
Partial college/technical training		16.9		
College graduate		26.1		
Graduate degree		14.5		
Mother's work status	357			
Home		59.9		
Part time		17.4		
Full time		22.7		
Ethnic background	310			
White		82.5		
Black		13.8		
Hispanic		2.0		
Other		1.7		
Geographic area	324			
Rural		33.6		
Suburban		53.4		
Urban		11.8		
Number of children in family (average)	357		2.1	1.3
Children's age (average months)	357		20.7	8.4
Age began intervention (months)	353		9.2	8.0
Children's sex	357			
Male		57.0		
Female		43.0		
Developmental status of child	350			
Average to above average		28.0		
Slightly below average		19.7		
Delayed		32.6		
Very delayed		19.7		
Program setting	354			
Center-based setting		35.0		
Center-based with home component		23.2		
Home-based setting		41.8		
State of residence	355			
Florida		18.5		
Georgia		5.9		
North Carolina		21.6		
South Carolina		9.2		
Virginia		44.3		

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Table 2. A Comparison of 1992 and 1988 Family Service Activities as Measured by the Family Focused Intervention Scale (FFIS)

Categories	1992 sample[a] (N=357)	1988 sample[a] (N=252)	1988-1992 FFIS change
Systems Engagement	53%	51%	+ 2%
Child information	65%	60%	+ 5%
Instructional activities	63%	59%	+ 4%
Personal/family assistance	40%	19%	+ 21%
Resource assistance	35%	37%	+ 2.1%

[a] Percentage of respondents indicating the services were almost always or always a part of the services they received.

Family Intervention Service and Importance Ratings

FFIS scores for the total sample are presented in Table 2. These scores are the mean percentage of items from each subscale that received ratings of 5 and 6. They provide an estimate of the number of family services that are "almost always" or "always" a part of children's intervention program. To provide a context for interpreting these data, Table 2 also includes FFIS scores for a national sample of mothers of birth to 3-year-old children that was surveyed in 1988 (Mahoney et al., 1990).

As indicated in Table 2, respondents reported that their early intervention programs gave the greatest emphasis to family-service activities related to the development and functioning of their children (e.g., child information and instructional activities). The integration of parents into community-based service systems (systems engagement) was also a major service activity. Services that focused most directly on family (e.g., personal/family assistance, resource assistance), as opposed to child-level concerns, represented the lowest level of activity of these programs. Nevertheless, compared to the 1988 national data, a higher level of personal/family assistance activities were reported, whereas all other family service categories received the same level of ratings across these two time periods.

Figure 1 depicts the relationship between respondents' ratings of the importance of the five categories of family services and the actual level of services that parents reported receiving. Two findings are noteworthy. First, the results of multivariate analyses of variance (MANOVAs) indicate highly significant differences between respondents' ratings of the importance of each of the five categories of family service activities and the amount of services they received, F(5, 352) = 41.15, p <.0001. Discrepancies between services and importance ratings were greatest in the categories of resource assistance (20%) and child information (19%) and least in the category of instructional activities (10%).

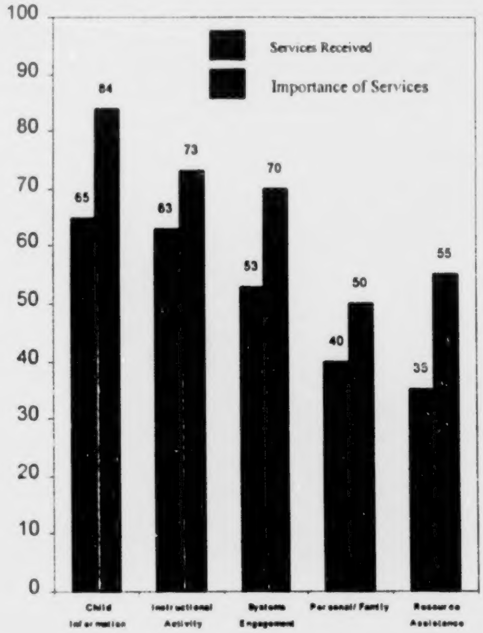

Figure 1. A comparison of parental ratings of services received to the importance of services

Table 3. Analysis of the Relationship of Service Delivery Model and Location of Residence to Early Intervention Family Service Activities

		Family service activity									
		Systems engagement		Child information		Instructional activities		Personal and family assistance		Resource assistance	
Variable	*N*	*M*[a]	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Service delivery model											
Center-based	124	47	31	54	31	50	31	36	27	31	30
Home-based	148	55	30	70	27	71	26	40	31	38	33
Center-based with home component	82	60	28	71	28	70	26	44	26	37	31
F		5.37		12.65		22.34		2.28		1.71	
Significance		.005		.000		.000		.10		.18	
State of residence											
State 1	77	58	29	72	28	64	29	44	31	44	34
State 2	154	52	30	67	28	70	25	38	26	33	30
State 3	63	58	31	60	31	55	32	44	31	36	32
F		1.41		2.92		47.32		1.44		3.48	
Significance		.25		.05		.000		.24		.03	

[a] Mean percentages of scale items that were *almost always* or *always* provided to families.

Second, there was a general correspondence between the rank ordering of the importance of family service categories and the rank ordering of the amount of services families reported receiving. Supporting this trend was the pattern of correlations between the amount of services respondents reported receiving and their ratings of the importance of these services, all of which were significant at the $p < .001$ level. Service-importance correlations were as follows: systems engagement, $r = .35$; child information, $r = .41$; instructional activities, $r = .41$; personal/family assistance, $r = .39$; and resource assistance, $r = .40$. Although these correlations accounted only for approximately 15%, of the variance in FFIS subscale scores, the magnitude of the correlations were likely attenuated by a ceiling effect in importance ratings. Thus, these findings seem supportive of the view that the services that early intervention programs provide to families are highly responsive to their needs.

Intervention Factors Contributing to Service and Importance Ratings

A MANOVA was conducted to examine the relationship between the early intervention service delivery models and the types of services families reported receiving. Results from the MANOVA were highly significant, $F(10, 702) = 5.44$, $p < .001$. Univariate F tests, reported in Table 3, indicated that respondents received higher levels of systems engagement, child information, and instructional activities in home-based or center-based programs with a home-based component than in center-based programs ($p < .01$). Respondents receiving home-based services also received higher levels of personal/family and resource assistance than respondents receiving center-based services, although differences were not statistically significant. A similar analysis conducted to determine how importance ratings varied across service models was not significant.

To determine how services vary with place of residence, MANOVAs were conducted to examine the distribution of family services and service importance ratings across three states. Because of the low numbers of respondents, two of the original five states were dropped from this analysis. Results were highly significant for service ratings, $F(2, 309) = 5.01$, $p < .001$, but not for importance ratings. These findings indicate that place of residence contributes considerably to the variability in certain types of services early intervention programs provide, although there were no differences in the types

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Table 4. Regression Analysis of the Relationship of Child and Family Characteristics to Early Intervention Family Service Activities

Variables	Family service activity				
	Systems engagement^{a}	Child information^{a}	Instructional activities^{a}	Personal and family assistance^{a}	Resource assistance^{a}
Child characteristics					
Developmental status	.05	.03	−.05	.01	.09
Chronological age	−.06	−.10	$-.13^{*}$	−.01	−.05
Family environment scale					
Control	$.17^{**}$	.10	$.14^{*}$	$.13^{*}$	$.19^{**}$
Recreation	−.05	.06	.01	−.04	.08
Cohesiveness	$.18^{**}$	$.15^{*}$	$.14^{*}$	$.17^{**}$	−.05
Expressiveness	.03	$.19^{**}$	.08	.04	−.05
Family resource scale					
Childcare	.03	.05	−.11	.05	−.02
Time	.07	.05	.10	$.17^{**}$	$.15^{*}$
Finances	$-.15^{*}$	$.16^{*}$	$-.17^{*}$	$-.26^{***}$	−.11
Physical supports	.01	−.08	.10	−.01	$-.21^{**}$
F value	3.14^{***}	4.27^{***}	3.61^{***}	3.76^{***}	4.12^{***}
Adjusted *R* square	.07	.10	.08	.08	.09

$^{*}p \leq .05$. $^{**}p \leq .01$. $^{***}p \leq .001$.
^{a}Beta values

of services parents rated as important. Univariate F tests, reported in Table 3, indicated that respondents from State 1 received the highest levels of child information and resource assistance, whereas respondents from State 2 reported the highest level of instructional activities. Differences across states could be attributed partly to differences in the service delivery models being used in the three states, $\chi^2(4, N = 311) = 43.7, p < .001$. Forty-one percent of the respondents from State 2 received no home-based services, compared with 17% of the respondents from State 1 and 10% of the respondents from State 3. Analyses of services by geographic location across states were also significant. Families living in rural areas reported the highest levels of services while families in urban areas reported the lowest levels of services.

Correlations were computed to examine the relationship between the frequency that respondents participated in early intervention and the amount of family services they received. Results indicated that neither the length of time (measured in months) that respondents participated in early intervention nor the number of center-based activities they attended each month were related to any of the five categories of family intervention services. However, there were moderate, but significant, correlations between the number of home visits and amount of child information, $r = .23, p < .001$, and instructional activities, $r = .25, p < .001$, respondents received.

Relationship of Family and Child Characteristics to Family Intervention Services

Full-scale multiple regression analyses were conducted to determine how characteristics of children (developmental status and chronological age) and their families (FES and FRS) were related to each of the five categories of family services respondents reported receiving. FES subscores included cohesiveness, expressiveness, control, and recreational opportunities. FRS subscale scores, as determined by factor analyses, consisted of the adequacy of childcare, time, finances, and physical supports (e.g., medical care, access to telephone). Results from the regression analyses are reported in Table 4. In general, although each of the five regression equations yielded significant results, the amount of variance explained by the independent variables was low. The types of family services respondents received from their programs generally were not related to the child characteristics entered into these equations. One exception to this was the negative association between the amount of instructional activities respondents received and the age of their children. There were several low but significant associations between family service activities and family characteristics. The majority of these relationships suggest that respondents with positive family characteristics, who are likely to have fewer needs for support, received the greatest amount of services.

There was some indication that families who rated their financial and physical resources as inadequate received greater levels of personal family assistance. However, findings regarding financial resources were confounded by the fact that parents reporting the lowest level of satisfaction with financial resources were often the parents who did not work and thus stayed home with their child, $F(2, 309) = 1.6$, $p < .20$. Seventy-four percent of the parents who stayed home full time received sonic type of home-based services as compared to 54% of respondents who worked part time and 50%, of respondents who worked full time, $\chi^2(4, N = 355) = 18.4$, $p < .0001$. As indicated in Table 3, family services were significantly more prevalent in early intervention programs with home-based components.

Analyses conducted to examine the effect of the educational level of parents indicated that mothers who had less formal education received more services than mothers who had higher educational levels. However, the education level of mothers was not associated with their need for child information, instructional activities, and systems engagement, but was associated with needs for resource assistance and personal and family assistance.

Discussion

This study examined the extent to which parents perceive their early intervention programs as providing family-versus child-centered services. The questionnaire used for this study incorporated two strategies. First, it asked parents to characterize the type and intensity of services their programs provided. This information was used to determine the extent to which early intervention programs were addressing the comprehensive array of family services outlined in federal legislation. Second, the questionnaire included items that assessed parents' needs and priorities for service to examine how the concerns of families influenced the types of services parents received from their early intervention programs.

Overall, the distribution of services reported in this study depicted a pattern in which early intervention programs seemed to be working directly with parents in addressing a diverse array of child and family issues. Nevertheless, the predominant focus of these services was the development and functioning of the child. This was indicated by the high proportion of respondents reporting that child information and instructional activities were the most dominant activities of the services they received. While this pattern might seem incongruent with Part H, it does coincide with what parents deem important.

Despite this emphasis on the development of the child, there also was strong evidence indicating that early intervention programs were emphasizing services to help parents deal with systemic issues. More than half of the respondents reported that their programs provided an array of services that helped them to utilize formal and informal sources of support and to integrate their child and family into the community. These results suggest that the majority of programs represented in this study had a view of service responsibility that extended beyond the immediate developmental concerns of the child. These programs helped families address the future needs of their children by increasing their awareness and access to other community-based services that could continue to assist them beyond their involvement in early intervention services.

Perhaps the two categories of service most closely associated with the comprehensive family service model are personal and family assistance and resource assistance. These services are targeted at family-level as opposed to child-level concerns and clearly extend beyond traditional boundaries of early intervention. Two observations are noteworthy about our findings with respect to these services. First, almost all of the respondents indicated that their programs provided at least some services associated with each of these categories. The pervasiveness of these activities indicates that most early intervention programs acknowledged the legitimacy of providing these types of services. The second observation is that family concerns not associated directly with the developmental well-being of the child were emphasized far less than child-related concerns. Overall, the analyses indicated that respondents were almost 50% more likely to report services related to child- versus family-level concerns. However, discrepancies between the amount of services parents receive and their ratings of the importance of services indicates a continued need for increased levels of all five categories of services investigated in this study.

Another way to evaluate the extent to which early intervention has moved toward a comprehensive family service model is to examine how the focus of intervention services changed over a 4-year time span (1988-1992). Although in 1988 service providers worked directly with parents, this was not a mandated practice, nor was it a practice that early interventionists were adequately trained to carry out. Yet, at that time, a national sample of parents who had demographic characteristics comparable to those of the present sample gave nearly identical ratings for four of the five categories of services assessed by the FFIS in this study (Mahoney et al., 1990). The one category of service where there appeared to be substantial change (between 1988 and 1992) was personal and family assistance. This continued to be a relatively minor focus of intervention services during 1992, yet the level of these types of activities was approximately 100% greater than reported by the 1988 sample. It therefore appears that 1992 early intervention programs provided services that in many ways were comparable to those provided in 1988. However, programs also appeared to be responding to mandates for comprehensive family services by doubling their efforts to help parents and other family members cope with the stresses associated with adjusting to and caring for their children.

Although there are clear indicators that early intervention programs have been progressing toward the comprehensive family service model envisioned by federal law, the question remains whether programs provide services based upon their own initiatives or in response to the priorities and needs of families. Results from this study present a mixed picture. On the one hand, the strongest associations identified in this study were the positive correlations between the services parents rated as important and the types of services they actually received. Although programs did not provide parents all of the services they deemed important, the congruence between parents' ratings of services received and the importance of services was highly consistent with the view that early intervention provided services in response to parent priorities. However, because the direction of effect cannot be determined from correlational analyses, an equally plausible interpretation of these findings is that the types of services parents received influenced their notions about what were desirable or important services.

On the other hand, several of the analyses conducted in this study suggested that some of the structural features of intervention programs outweighed the concerns and needs of families as determinants of services. For example, compared to center-based programs, home-based programs and center-based programs with home-based components provided higher levels of all five categories of services, although differences were significant in only three of the five categories. These findings are consistent with results reported by Able-Boone, Goodwin, Sandall, Gordan, and Martin (1992) and Upshur (1991). They are also noteworthy in view of the fact that parents' ratings of the importance of services did not differ across service settings. In addition, analyses conducted to examine how services differed across states provide a similar picture. Although there were no differences in importance ratings across states, the states in which parents resided had a significant impact on the types of services they received. These findings suggest that factors such as program access to parents and state resources and policies may be greater determinants of the types of services parents receive than are parents' personal preferences.

One of the dilemmas related to providing "family-needs-driven" early intervention services is how to determine what actually constitutes need. Generally, needs are assumed to be caused by parents lacking the information, resources, and support that are necessary for raising children and addressing their developmental concerns. In practice, however, needs are usually determined by asking parents what services they would like to receive, as opposed to assessing their status regarding childrearing resources. This procedure presumes that parents will ask for services that are reflective of their legitimate needs. Programs providing services based upon a family-needs-driven model should therefore provide greater levels of assistance to parents having limitations in childrearing resources.

Results from this study provide little support for this family-needs-driven model. To the extent that our regression analyses were sensitive to factors contributing to family service activities, it appeared that families having the greatest level of childcare resources, such as adequate time and positive family functioning characteristics (e.g., cohesion, control, and expressiveness) were the most likely to obtain all five categories of family services. We found some indication that resource assistance activities were provided more frequently to families reporting inadequate levels of physical support. In contrast, parents with limited childrearing resources were the least likely to receive service activities related to these needs. Overall, families reporting the greatest levels of services were those who had sufficient time to participate and the resources and personal skills needed to effectively negotiate services.

It would seem that perhaps a family-needs-driven model provides capable parents greater opportunities to negotiate the services they would like to receive for their children and families. Although service providers must refrain from forcing their opinions and services upon families, they must also recognize that parents' failure to communicate needs may not indicate a lack of need for services. Programs must be alert to the possibility that some families with great levels of need may have limited capabilities of expressing and negotiating these needs, even in service environments that are highly supportive and responsive to parents' priorities.

Generalizations regarding these findings must be tempered by some of the limitations of our procedures. First, although this study included a large sample from intervention programs representing a diverse geographic region, the sample was not randomly selected and included only five states. Because of this selection process, there is no way of knowing whether those administrators and parents who agreed to participate are representative of individuals engaged in early intervention, nor is there any way of knowing if the states represented are similar to other states throughout the country. The procedure of asking service providers to select typical parents from their caseload likely resulted in an overrepresentation of parents who were actively involved in their children's service programs. This bias may have resulted in respondents reporting a more positive view of early intervention services than might actually occur. Second, although previous studies suggest that the FFIS is a reliable instrument for assessing the general pattern of early intervention services, no study has yet been reported that indicates how ratings on this scale are associated with the type of services families actually receive. Therefore, although mothers' perceptions are an important source of information for evaluating intervention services, they may not provide an objective picture of what actually takes place.

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Infants and Young Children
10(1), 47-60

Early Intervention: Meeting the Unique Needs of Parent-Child Interaction

Infant development is dependent on interactional relationships. Successful family-centered early intervention must address the relationships between the parent and child, child and clinician, and parent and clinician to promote infant development. The interventionist must also consider the unique family system and the family schema and paradigm when designing the intervention plan. The intention of this article is to use three case studies to illustrate the use of an intervention model that focuses on fostering the development of family relationships as a means of meeting identified outcomes from an individualized Family Service Plan. Key words: early intervention, occupational therapy, parent-child interaction

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The author acknowledges the assistance and support provided by David Corsini, PhD, University of Connecticut, and Joanie Baldwin, MEd, Connecticut Children's Medical Center.

A family-centered approach is the fundamental intervention model promoted in Part H of the Education of the Handicapped Act Amendments of 1986.[1] The intention of this article is to present three case studies that illustrate the application and outcome of family-centered intervention using strategies described by McCollum and Yates.[2] These authors identify the need to focus intervention on fostering parent-child interaction instead of addressing isolated skill development within the child.[2] The application of this intervention model is founded on professional respect and regard for parents regardless of parental socioeconomic status, cultural background, or experience.

Several authors have discussed the need to involve parents in the planning of intervention programs and the development of goals for a child with special needs.[1-8] The early intervention program must shift focus from an isolated view of the infant to a program that will not only encourage parental participation but will also support and promote family strengths and abilities.[1,2,6-10] This family-centered approach to intervention is based on the concept that an infant or toddler with special needs is intimately imbedded within a family. If an early intervention plan fails to recognize this relationship, the effectiveness of the service provided will be compromised. The model of intervention discussed within this article focuses on the interaction of the family, the child with special needs, and the service provider to meet the identified outcomes.

Family-centered intervention also recognizes that infant development is not merely attributable to the provision of a specific service to foster infant skills but, rather, that infant development is closely linked to infant-adult interaction.[11] Provence[11] discusses the need to recognize infant development as a product of interaction with parents/caregivers. Infant-adult interactions also enhance parental role development in the context of the family. Greenspan and Greenspan[12] discuss this mutually supportive relationship as "the essential partnership" in their book of the same name.

Recognition of how infant-parent interaction influences development has changed the face of early intervention services. Previous intervention models, even when provided in the

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home, were primarily focused on the infant with special needs and the acquisition of specific skills.[1,13] This child-centered model of intervention failed to utilize the powerful tool of infant-adult interaction to promote development. Professionals who provide early intervention services in the home must recognize the importance of the interactional relationship within the family.[1,14] This professional also has a unique opportunity to provide assistance to the parents in understanding the style of interaction between the infant and themselves. As an example, an infant with decreased muscle tone in the face may have limited facial expressions, but the absence of smiling does not mean there is a lack of love between the infant and parent. The early interventionist plays an important role in fostering the understanding of interactional skills and abilities between the parent and the infant with special needs.

There is an increased understanding of the influence of the parent-provider relationship on infant development.[14] Interactional subsystems of the parent-infant, parent-provider, and the infant-provider relationships must all work in concert with one another to foster growth in the entire family including the infant with special needs. This presents a particular challenge to the early interventionist. The effectiveness of intervention strategies depends not only on fostering the relationship between the infant and parent but also on recognizing the critical importance of the relationship between the service provider and the family.[14]

McCollum and Yates identify three subsystems of interaction-(1) the parent-infant, (2) parent-provider, and (3) infant-provider-as the triadic strategy of intervention.[2] These authors clearly discuss the importance of providing intervention from multiple vantage points to foster development. They also present an important paradigm shift in regard to intervention. Instead of using the parent-infant dyad as a means to foster infant development, their focus is on the primary of the relationship in development of family roles.

Basic strategies were outlined by McCollum and Yates[2] to assist the service provider in utilizing this triadic approach to family-centered intervention. These strategies include such items as providing a supportive relationship with the parent without adopting an "expert" role. They state that the environment plays an important role in the development of the parent-interventionist relationship. The parent should feel comfortable within the environment, and the setting should promote interaction between the parent and the child. Another critical strategy is the need not only to recognize but also to identify parental strengths as they interact with their infant. McCollum and Yates[2] recommend that the interventionist verbally identifies specific parental competencies and acknowledge the rich interaction between the parent and infant. To foster the parent-child interaction, the service provider should focus the parental attention on competent behaviors demonstrated by the infant. Modeling appropriate interaction within the infant-provider dyad is a method suggested by McCollum and Yates[2] to expand the parent-child repertoire. The interventionist then provides specific suggestions to the parent to foster further interaction between the parent and the child.

It is critical for the early interventionist to foster family interaction as a means to enhance infant development. One primary tenet of family-centered intervention identifies the family as the constant in the child's life, and, therefore, the family must be considered as the primary change agent in the child's life.[1] This returns to our initial concept that role development of both the parent and the child can be enhanced by addressing the interactional relationships instead of focusing on a single system.

Three case studies illustrate how this triadic strategy can be effective in enhancing parent-infant interaction that promotes infant development. In all three cases, both parents were involved in the intervention process, and distinct differences were articulated between the role development of the mother and the father in regard to their infant with special needs.

Bentley and Fox[15] suggest that parents tend to have similar expectations for their children in regard to development, a concept that was supported in all three cases to be described. This is an important foundation to consider in the design of intervention strategies. The provision of occupational therapy for these three cases was based on the developmental need of the children. Understanding that both parents may have concerns regarding the development of their child necessitated the inclusion of the father-infant dyad as a focus of the intervention program. Inclusion of the father-infant dyad in early intervention programs is increasingly recognized as a critical component influencing the effectiveness of an intervention plan.[16]

Family-centered intervention requires professionals to consider their own personal values, attitudes and biases regarding concepts of parenting. An intervention focus must also be clearly articulated. A program designed for parent education will have a distinctly different design from a program designed to foster parent-infant interaction skills.[17] Effective. provision of these services within the home also requires the professional to develop cultural sensitivity and competence.[17,18] Consideration must be made regarding both the family schema and paradigms for functioning.[18] A family schema addresses how the family members view their role within the world at large. This may include acceptance or rejection of Western medical practices, a belief that family integrity is primary, and the needs of the individual come second, and may also provide a perspective on the view of disability in an individual. Certain cultures lack terms to describe a disabling condition. A family paradigm incorporates the day-to-day functioning within the family, such as an individual's role within the family, schedules, and responsibilities.[18]

In all three cases, multiple vantage points were synthesized. The father-infant interaction needed to be included in the plan, considering that the focus of the intervention was to address parent-child interaction and not just mother-child interaction. The desired outcomes of this intervention plan addressed both enhanced parent-child interaction and specific improvement in the child's skills. The unique family schema required consideration-particularly the role of the family within the community. The economic status for these families ranged from middle income to low income. All three cases were of Hispanic descent from a Puerto Rican heritage. This necessitated careful examination of personal values and attitudes toward parenting by the clinician with a Caucasian background. In addition, attempts were made to understand each family's unique day-to-day functioning, so intervention services would be viewed as a positive collaboration, not a burden. In all three cases, a sibling was included in the intervention plan.

All three cases were being served through the Birth-to-Three program within the state of Connecticut. An Individualized Family Service Plan (IFSP) for each family had been established prior to the first home visit. Each IFSP identified the need for occupational therapy services. Although all families identified that they had articulated the goals stated on the document, all families were unclear as to the role of an occupational therapist in implementing the plan.

The author, an occupational therapist with 19 years of experience working with children and families, provided the occupational therapy service for all three families. The families were assigned to this therapist because of a close geographic proximity. All three families agreed to have their unique experiences included in this article.

CASE 1

This family consisted of a mother and father, both in their 20s; a 3-year-old daughter; and MB, a boy, who was 2 years, 3 months, at the time of the first home visit. The length of MB's length of intervention program with this occupational therapist was 8 months. Both parents were of Hispanic descent with a Puerto Rican heritage, but English was the primary language spoken within the home. Parents were raised in the Northeast. Both parents worked outside the home and would be considered to be of a middle-income status. The daughter had no identified delays and appeared to be functioning appropriately for her age. MB had a diagnosis of autistic disorder and was receiving center-based play-group intervention twice a week in addition to home-based occupational therapy once a week. The initial primary concern, presented to the occupational therapist, revolved around MB's poor eating habits and tactile hypersensitivity around the mouth. His sensory problems affected his willingness to try foods other than milk and dry cereal. He ate while wandering around the house instead of sitting at the table. Parents had tried using a highchair at mealtime, but MB would scream and refuse to eat anything. Parents expressed concern regarding the disruption of family meals due to MB's behaviors. MB was within normal limits for height and weight.

During the initial home visit, the role of an occupational therapist through the Birth-to-Three program was defined. Beginning discussions revolved around family schedules and demands and identified the primary concern of each parent in regard to the interaction with the parents' son. Concrete questions provided a framework for this discussion, such as, "Tell me about what it is like to get your son to eat a meal." This type of discussion occurred over the next three home visits, leading to intervention being designed to foster ease in the care of their son. An example of intervention strategies was to schedule the home visit during a mealtime. The occupational therapist provided suggestions first to decrease MB's tactile hypersensitivity around the mouth. Next, activities were introduced to encourage MB to sit at the table for a brief period of time while the family had a meal. MB would sit at the table momentarily but would not eat at the table. Instead, he would leave the table to follow his mother to the refrigerator as she would fill his cup with milk. The therapist suggested that his cup be placed on the table as the family was sitting to have a meal and that the cup be filled at the table. Parents felt this would be an acceptable strategy and would not interfere with the mealtime process. They specifically stated that they did not want to use techniques that would be punishing because they felt MB would not understand the consequences of his behavior. The family began to incorporate these suggestions into their day-to-day operations or paradigm.

An understanding of the family schema and paradigm emerged after several home visits.

Family schema

The parents viewed their son as having a disability but felt that intervention would be helpful in remediating this disability, specifically intervention from established institutions, such as the medical and educational communities. They also expressed concerns regarding their son's ability, to interact with the larger community when the family went out for meals or shopping. MB engaged in self-stimulatory behaviors, such as always needing to have a small toy held in his hands, rocking, and occasional head banging. Both parents had concerns that these behaviors would influence their son being accepted by the general community. The parental view was that occupational therapy services were provided specifically for MB in a traditional problem-based model. Initially, they did not view intervention services within a family-centered context.

Family paradigm

Although both parents worked, the father worked days, and the mother worked afternoons and evenings. Both parents shared responsibility for MB during meals and personal care tasks, such as dressing, grooming, and bathing. Specific interactional differences between both parents emerged with further discussions. MB's mother was specifically concerned with MB completing personal care tasks independently and had an expectation of when these tasks should be completed independently based on her experience with her daughter. MB's mother also felt that MB could not be held responsible for his actions and was uncomfortable setting limits with MB. This created a great deal of difficulty for her with her daughter, who was articulate, appeared to be quite bright, and would often provoke MB to engage in self-stimulatory behavior, or would take away one of the small toys he would always hold. The mother did use discipline techniques with the daughter, such as sending her to her room, but felt it was "not fair" to use discipline techniques with MB because "he doesn't understand why he's being punished." When frustrated, MB would often hit his mother, but his mother did not engage in limit-setting techniques to diminish this behavior. The parents used the term *punishment* instead of *discipline* when discussing behavioral strategies. The father's interactional style was more play oriented, even though he shared in the responsibilities for MB's care. He viewed his role as a helper in regard to dressing and grooming tasks for MB. He used discipline techniques with MB such as saying, "No throwing!" and would often encourage MB's mother to use the same techniques. The father also engaged in more gross-motor play activities with MB. He appeared concerned over MB's behavior in the community during family outings but less than the mother's overwhelming concern regarding MB's unusual behaviors.

Progression of intervention program

Initially, intervention revolved around the development of specific skills, such as encouraging MB to sit at the table with the family for meals. As sessions progressed, further discussions with parents revealed additional concerns. The mother had specific concerns that when she was at home, MB would always follow her around and displayed no ability to engage in self-directed play activities. He would engage in self-stimulatory activities, such as rocking, but she wanted him to play with toys appropriately. She also discussed her concern that she was able to read to her daughter and engage in play activities that required fine-motor skills, such as puzzles, but did not have this type of relationship with her son. She expressed concern that she could not engage both children in a play scheme at the same time. Her style of parent-child interaction reflected a preference for more quiet activities than gross-motor activities. Further intervention strategies revolved around developing strategies where she would be able to interact with MB in a mutually rewarding manner.

The first strategies addressed increasing the reciprocal interaction between the mother and MB. The mother reported that she had previously tried to play ball with MB but that she discontinued the activity when he was unable to catch the ball. Teaching of this task began with simply rolling a ball back and forth with no demands placed on accuracy of skills. The mother would roll or bounce the ball to MB, and he would pick it up from the ground. She would first ask MB to give her the ball, then ask MB to try and throw the ball, accompanied by praise and encouragement. He enjoyed rolling and bouncing a ball with her and demonstrated increased eye contact during this activity. MB also demonstrated the ability to engage in reciprocal interactions. His mother reported that this was one of the first times she had seen MB wait for the ball to be rolled or bounced to him instead of taking the ball away from her. Suggestions were then made regarding a table-top activity, which was in keeping with mother's style of parent-child interaction but had very limited technical demands for MB to limit the potential for frustration. One successful activity was for the mother and MB to play by peeling stickers off a sheet and placing them on a sheet of paper. To engage the sister, additional sticker sheets were provided so the mother could engage both children in this activity. The behavioral changes noted during the play activity represented an interesting outcome of this model of intervention. First, MB would occasionally look at the sister as she was peeling stickers off her sheet, and then he attempted to peel stickers off his sheet. Finally, the mother provided less support while the sister engaged in this play activity with MB as a "helper." The sister would begin peeling the sticker off the sheet and then give the sticker to MB to place on his paper, modeling praise comments such as, "Good work!"

Interaction between the father and MB was also addressed during home sessions. The father's style of interaction, as mentioned before, revolved around more gross-motor activities. He expressed concern over MB's lack of skills and decreased reciprocal play behaviors with his sister. The father had reported that MB could not independently jump and was very cautious regarding gross-motor activities. Thus, strategies were developed that revolved around using gross-motor activities that not only enhanced MB's sensory processing skills but also focused on reciprocal play schemes between the father, MB, and the sister. One activity that proved to be very successful was the "jumping frog" game. The father would hold MB's hands and then provide assistance for MB to "jump like a frog" by giving a big lift as soon as MB initiated the effort to jump. Also incorporated was the concept of counting; the father would count off 10 jumps, and then it would be the sister's turn to engage in the "jumping frog" game. The outcome of this play intervention scheme resulted in first, a rewarding physical game for both the father and MB to play, and second, the opportunity to engage both children in a "taking turns" game. The father felt this game would enable his son to acquire some gross-motor skills.

Throughout the progression of the intervention program, discussions with both parents revealed a distinct difference in how limits were provided to MB. The father seemed very comfortable with saying "No!" to specific behaviors and would specifically label the unacceptable behavior. MB's mother did not feel comfortable using this strategy and reported that when she did attempt to use this technique, MB would repeat the undesirable behavior. An alternative strategy was discussed where the mother would redirect MB to another activity, such as listening to music or holding one of his toys. She did begin to use the phrase "No hitting!" when MB would hit her in frustration. She further discussed concerns that if she continued to let him hit her he would not develop more adaptive behavioral strategies. The mother still struggles with the concept of discipline with MB but has started to utilize some strategies, such as redirection of his attention.

Analysis of intervention

Throughout the intervention program, both parents were provided with support regarding their concepts of child-rearing practices and personal style of interaction. Each parent-child dyad was viewed in the context of the family dynamics and was respected in terms of personal preferences. Initial parental concerns were addressed at the beginning of the intervention program. This allowed the intervention plan to progress to more interactional relationships instead of interventions designed to "cure" MB. In addition, the daughter was integrated into the intervention plan to foster the transfer of parental role concept in regard to the daughter to MB. Having the parents interact with both children instead of just the "designated patient" allowed them to extend their achieved role relationship between parent-daughter to parent-MB and achieve a sense of integrity with their family role. Both parents had expressed a dichotomy between their parental role with the daughter and their parental role with MB. It was also important to recognize the unique view each parent held in regard to the role they maintained within the family. By utilizing the triadic strategies identified by McCollum and Yates,[2] gains in interactional skills were made. In addition, these strategies provided the foundation for MB's developmental skills to progress, which was important for meeting the identified goals stated on the IFSP. MB still receives occupational therapy services within the home and is now able to eat small meals at the table with his family. The focus of current intervention is on transitions to the larger community to allow the parents to take both children on outings.

CASE 2

This family consisted of a mother in her late 20s; father in his early 30s; older, 4 1/2-year-old brother; and DR, a boy, who was 2 years, 4 months, at the time of the first home visit. The length of DR's intervention program with this occupational therapist was 7 months. Both parents were of Hispanic descent with a Puerto Rican heritage. The mother was fluent in English, and the father could understand English. A mixture of both Spanish and English was spoken in the home. The parents had lived in the Northeast for the past 3 years. Both parents worked outside of the home. The family was at a low-middle economic status. The older son had slight developmental delays and was receiving services through a preschool program. DR also had a diagnosis of developmental delay. In addition to occupational therapy, speech-language therapy and special instruction were provided within the home. The mother articulated primary concerns around DR's difficulties with chewing foods, slowness in eating meals, frequent choking, and overfilling his mouth with food. She was also concerned with his "unusual" use of his hands. He displayed tactile hypersensitivity, attempted to play with toys using only his fingertips, and avoided toys that required use of his entire hand. He also displayed oral tactile processing problems where he would overfill his mouth before attempting to chew foods, resulting in frequent choking and gagging. In addition, low muscle tone was noted throughout DR's trunk and extremities.

As in the previous case, the initial home visit with this family included a discussion of the role of an occupational therapist and identified information regarding the parents' work schedules and personal demands on their time. The mother worked days but was home until 9:30 AM, and the father worked second shift, so he was home during the mornings. The mother led the discussion regarding her concerns with DR's feeding patterns. The father did not offer any concerns, deferring all questions to the mother. The mother clearly outlined her concerns, identifying specific skills that she wanted to see developed in DR's feeding behaviors. During the initial phase of intervention, appointments were scheduled in the early morning during breakfast when both parents were available. The family's schema and paradigm emerged after a few visits.

Family schema

The mother provided all the information regarding parental concerns for DR. The father was present during part of the discussion but deferred to the mother for responses. The mother definitely viewed DR as the recipient of the service and had specific expectations of outcomes based on the provision of occupational therapy. These outcomes were all defined in terms of DR's performance skills. The mother expressed a desire that DR demonstrate skills appropriate for his age. She particularly wanted DR's skills to improve prior to his entrance to school. There appeared to be a strong commitment to both children and to their participation in established educational programs.

Family paradigm

The mother reported that she was responsible for the primary care of the children in terms of meals, dressing, and bathing. The father provided assistance and support for these tasks, but this was the mother's primary role within the family. The mother identified that DR was viewed as having a disability, which compromised her parental role with him.

The family's schedule was complicated by the fact that the father's work schedule varied from week to week depending on shift requirements. This required that the mother try to modify routines on a weekly basis to provide meals for the children and the father. In addition, the oldest son attended a daily preschool program. The grandfather occasionally served as a day-care provider if neither parent was home due to work schedules.

Both parents disciplined the children, but the mother reported that she set firmer limits than the father. The mother also revealed that she had less tolerance than the father for "unacceptable behaviors" from both children. Unacceptable behaviors were identified as the boys yelling in the house, grabbing toys from each other, and hitting each other. The mother used techniques such as raising her voice, separating the boys, and using time out in their room if these behaviors were displayed. The father tolerated more of these behaviors but also used raising his voice to control "unacceptable behaviors." Both boys appeared to receive the same type of discipline and were held accountable for their respective behaviors. Both parents reported that DR definitely exhibited more unacceptable behaviors than his older brother. DR was much more likely to be the instigator of fights by pulling toys away from his older brother. Both boys played with each other, but DR was far less successful in play schemes than his older brother. It appeared that DR's low muscle tone interfered with his success in play activities. DR also displayed low frustration tolerance as tasks increased in complexity or required more refined skill, such as playing with Legos or video games.

Progression of intervention program

Initially, intervention focused on assisting the mother with strategies to improve DR's feeding behaviors. The activities addressed both sensory techniques to improve DR's awareness of food within his mouth and also behavioral strategies to decrease his tendency to overfill his mouth with food. The first few sessions were held during breakfast to suggest strategies to improve DR's feeding behaviors. These suggestions focused on basic organizational concepts that appealed to the mother, considering her skills in this area. The father was not present during breakfast meals. The focus of this first intervention phase was on the interactional skills between DR and his mother during meals by improving DR's feeding behaviors. Because the mother was not as fearful of DR choking during meals and did not have to be as vigilant regarding his feeding behaviors, she was able to promote greater social interaction.

The mother then identified that she was concerned about DR's hand skills and his "temper." Appointments were shifted to afternoons to accommodate the change in focus. The rationale for change was twofold in nature. First, the mother would be home from work and would be less confined by a tight schedule. Second, the older brother would be home from the preschool program. Intervention could then focus on interactive play schemes between the brothers that would be more in keeping with the mother's concerns regarding appropriate behavior. At this time, the father was working afternoons and would only be home for a few minutes at the beginning of the intervention session. This, unfortunately, limited intervention addressing father-DR interaction. However, suggestions were provided to the father regarding engaging DR in play activities.

Intervention strategies focused on the boys taking turns with gross-motor activities. This was structured not only to enhance DR's sensory processing and hand skills but also to reflect the mother's concern that when the boys "roughhoused" together, the end result was always a fight. The mother served as the director of the play scheme to promote her role with both children as the organizer. The activity also provided a setting for the boys to interact in a manner that was acceptable to the mother by requiring them to take turns. After a few sessions, she reported that the boys could now occasionally play together without fighting.

As the intervention program continued, the work schedule of both parents changed, and the father was assigned to the third shift. This allowed appointments to be moved to accommodate the father's schedule, and the intervention program shifted to focus on the interaction between the father and DR. The mother was not available during many of these sessions but reported that she felt better now that the father was involved with DR's intervention program. Although the father primarily spoke Spanish, he understood English, and communication was adequate to clarify strategies. His basic concern revolved around DR's strength and low muscle tone. He was also concerned about DR's ability to "keep up" with other children. The father indicated that he played with DR and enjoyed this form of interaction but wanted to be more involved in helping DR improve his skills. The strategy adopted during this phase of intervention focused on promoting successful interaction between father and DR, while meeting the father's need to help improve DR's abilities. The suggestions provided a forum for the father to focus on his role in the promotion of motor competence. At later sessions, the father reported that the suggestions for interaction seemed to improve DR's strength. He asked about games that he could play with DR to work on his hand skills and dressing skills. The father was now expanding his role to provide additional support in the care of DR. The focus was on promoting independent skills in DR, with the father initiating active participation in the process.

DR still receives direct occupational therapy intervention with the focus now on higher level interactional skills between DR and his brother. Both the mother and father have expressed concern that, as DR approaches 3 years old, he will no longer be eligible for the Birth-to-Three services. Transition planning was explained to both parents, and they contacted the local school agency to discuss their concerns regarding service for DR.

Analysis of intervention

The intervention program focused initially on specific behaviors that were identified by the mother. The method employed to address these behaviors emphasized change that could be obtained through careful analysis of the mother-child interactional style in the context of the family needs. Initially, concerns revolved around a focus of practicality: feeding. When feeding improved, intervention was revised to focus on interactional relationships within the family while still responding to parental concerns. To meet this end, additional areas were addressed as identified by both parents with a focus on the use of their unique interactional strengths with DR. Although each parent voiced a unique role within the family context, both parents felt unsure of their interaction with DR. Previous strategies with the older son were not readily transferrable to DR. Once the unique strengths of each parent were identified, new strategies, in keeping with their parental roles, could be developed and used with DR. This approach was used to promote efficacy of parental roles within the family structure. The result has demonstrated that specific behavioral changes in the identified client may occur as a product of this interactional approach. Of additional interest is that the family identified their unique strength in supporting each other.

CASE 3

This family consisted of a mother in her early 20s; father in his early 20s; older, 4-year-old brother; and PA, a girl, who was 3 months (corrected for prematurity age: 1 month) at the time of the first home visit. The length of PA's intervention program with this occupational therapist was 4 months. Both parents were of Hispanic descent with a Puerto Rican heritage. Parents had been raised in the Northeast. Both parents spoke fluent English, but Spanish was the most frequently used language within the home. The mother did not work outside the home, and at the time of the initial visit, the father was unemployed. Their economic status fell in the low-income range. The older son seemed to be functioning appropriately for his age.

PA had been born prematurely and had remained in the hospital for 2 1/2 months after her birth due to several medical conditions requiring surgery. She had arthrogryposis, which meant that many of the joints of her arms and legs were stiff and poorly formed. She had bilateral club feet. She also had been born with gastroschisis, which meant that portions of her stomach and intestines had formed outside her abdominal wall and required several surgeries soon after birth to repair her digestive system. She was fed by a gastrostomy tube (G-tube) and received no oral feeds at the time of the initial visit. She also carried the diagnosis of Mobius syndrome, which produces bilateral facial paralysis and is associated with eye problems. PA was able to close her eyes but required lubricating eye drops several times a day. She displayed extremely low facial tone, which compromised her ability to suck on a pacifier.

At the time of the initial home visit, parents expressed primary concerns around the initiation of oral feedings with PA. While PA was hospitalized, both parents had been instructed in exercises to address the stiff joints in her arms and legs. They requested additional support in this area and had several questions regarding PA's eventual ability to move. Specifically, they wanted to know if she would walk.

At the initial visit, the family's schedule was discussed. Although neither parent worked ourside of the home at the time of the initial home visit, PA had medical appointments almost every day at different area hospitals. PA's father produced a schedule book with the next 2 weeks' appointments entered and discussed the difficulty he was having trying to make sure that the appointments did not overlap each other. A division of labor between both parents had already been established at the time of the first home visit. The father was responsible for maintaining the schedule and arranging transportation for all the appointments. The mother was responsible for bathing PA. Both parents were able to feed PA through her G-tube, but the mother reported that she was primarily responsible for this aspect of PA's care. Although both parents had been instructed in exercises to address PA's stiff joints, the father reported that he was primarily responsible for this activity with PA. The brother appeared concerned about PA and knew he was unable to hold her due to her problems. Parents reported that PA had received occupational therapy while she was hospitalized, so they felt they knew the role of the occupational therapist. Parents stated their expectation of the occupational therapy service in terms of changes in PA's status from a physical perspective. Two specific areas of intervention were identified by the parents: oral feeding and movement of PA's extremities.

During the first few weeks of intervention, the family's schema and paradigm emerged.

Family schema

The father repeatedly voiced concern about finding a "decent-paying job" because of anticipated medical expenses for PA as she matures. Although PA was currently covered by Medicaid, both parents felt that this source of funding was inadequate for potential medical needs of PA. Both parents viewed PA as the designated patient and recipient of service. They also ascribed a great regard for the potential of the medical community to improve PA's functional status. There was a strong commitment to both children by the parents.

Family paradigm

There was a clear division of labor established by the parents. The mother was responsible for the personal care of PA, and the father would provide support for these activities. The father accepted a role of managing the interaction with the medical community for all of PA's appointments. The mother and father shared general responsibilities for raising their son, but again, the mother was the primary person responsible for his personal care. Both parents expressed concern regarding the reduced amount of time they had to spend with their son. There was very limited interaction between the son and PA. The parents would let the son kiss PA but did not let him hold her.

Progression of intervention program

Initially, the focus of intervention addressed two specific areas of PA's care. The mother requested assistance with increasing PA's acceptance of food by mouth, and the father requested modification of PA's hand splints to provide more stretch to her joints. Appointments were scheduled around other existing medical appointments at area hospitals and clinics. During the first few sessions, the father began to express his concern about PA's ability to interact eventually with the larger community. This appeared to be in concert with his role within the family as the intermediary between the family and the community. The father was very concerned about the joint stiffness and limitation in movement in PA's arms. Specific activities were designed to promote father-PA interaction that would carry over to his desired outcome for PA to be able to interact in school and the community through improved use of her hands. New hand splints were fabricated in the home with the father present to incorporate his concerns regarding PA's joint stiffness in her hands.

During these initial sessions, intervention also focused on the mother's concern about being able to feed PA orally. Both parents also expressed concern regarding PA's lack of expression due to the low muscle tone in the facial muscles from the Mobius syndrome. This issue was addressed in a twofold manner. First, activities were designed to improve PA's vocalizations, enhancing communication between parents and PA. Second, activities were designed to improve PA's ability to suck on a pacifier as a precursor to feeding. Both of these activities focused on the parents' ability to enhance their interaction with PA. Prefeeding activities were addressed, but actual feeding activities were not introduced due to the development of gastrointestinal difficulties, which required a change from a G-tube to a J-tube.

As intervention progressed, the family's schedule changed. The father found a job and started working. Fortunately, this occurred as the frequency of PA's medical appointments were decreasing from several times per week to one or two appointments weekly. Occupational therapy sessions continued, but the day varied depending on the family's schedule.

During this period of time, the father continued to provide exercises and activities to improve PA's joint flexibility, and identifiable gains were made that were attributed to the father's interaction with PA. He was present for some appointments, but he reported that he felt comfortable with "his job with PA" and that we should focus more on the mother's concern about feeding PA by mouth. Gastrointestinal issues had resolved, so the mother asked the physician if it was safe to attempt to feed PA orally. The physician agreed, and a feeding plan was reinstated. Again, the focus was not merely on developing PA's oral motor skills but promoting mother-PA interaction.

To promote further the mother's directive role in the personal care of PA, the mother was asked what activities she would like to have addressed at the beginning of each session. Then, during the session, intervention techniques were demonstrated and practiced. Rather than correcting the mother's performance, she was asked for feedback regarding the activity, such as, did the activity seem to work? Was the position comfortable? Did PA seem to swallow when a certain technique was used? The goal during this phase of the intervention was to provide the mother with a forum to assume the direction of personal care tasks for PA as she already was for her son. The mother was initially hesitant with this type of session. Her prior experiences with "professionals" had placed her in a "receiving role" and not a "directive role." As therapy progressed, she became more directive with regard to the specific areas to be addressed.

The focus of intervention shifted slightly at this point. The mother's role within this family was one of a director and initiator of personal care of her children. During every session, the mother tried the suggested activities and was asked to provide her evaluation of the technique. Now, following every session, suggestions were provided for feeding activities that the mother could introduce to PA, without needing to have these activities first demonstrated. One example revolved around the shift in focus from working on bottle drinking to spoon feeding with PA. The mother had been successful in promoting bottle drinking in PA by using techniques she felt "worked." To promote the transition to spoon feeding, soft foods had been introduced on a nipple and pacifier with limited success. A baby spoon was provided, but demonstration of the use of this spoon with PA was not provided. Instead, after every session, it was suggested that the mother might want to try spoon feeding with PA during the upcoming week. The focus of intervention was not on PA's acquisition of spoon-feeding skills but, rather, on the mother providing direction as to when she felt it would be appropriate to introduce the spoon to PA. After several weeks, the mother reported that she had independently introduced the spoon to PA with success.

The brother was also incorporated into intervention activities. His "job" was to call out to PA to promote her turning of her head to improve strength in her neck muscles. Both parents took turns holding PA and then the brother would move from side to side to promote visual tracking and localization of sound as the brother called to PA.

Analysis of intervention

Intervention was designed to incorporate the parents' unique strengths within the family to produce desired outcomes. Both parent-infant dyads were strengthened in respect to each parent's unique role within the family. The brother was also incorporated as a change agent facilitating PA's progress. These improvements were not only in terms of the interactional relationships within the family, but also in the improvement in PA's skills. PA still receives ongoing occupational therapy service with the focus on enhancing the interactional relationships within the family.

IMPLICATIONS

Early intervention programs profess to provide a family-centered approach, yet there is an identified infant or child who requires specific skill development. Three cases were presented to illustrate the effectiveness of an intervention plan that focuses on the interactional relationships between the parent-child dyad in fostering skill development in the identified child. This focus on interaction was also extended to the siblings in all three cases. McCollum and Yates[2] described this model as being an effective method of providing family-centered early intervention. They described this model as a framework to support parent-child interactions but did not fully discuss the change produced in infant skills. Occupational therapists are included in an IFSP specifically to foster infant/child development,[1] so the question arises of whether the intervention plan is family focused or child focused. As was illustrated in the three case studies, this interaction model is family focused but also effective in fostering skill development in the child. Enhancing parents-child interaction in these three cases resulted in improved skills in all three identified children.

Concerns have been raised regarding the effectiveness of early intervention programs.[19,20] This brief presentation does not validate all early intervention programs but, instead, provides a view of how one model of intervention can be effective. Further research is necessary to validate this model of intervention. Specific characteristics of family skills and abilities may influence the success of the described intervention model. All three families had a strong commitment to the identified child, but all families initially perceived the provision of occupational therapy as being singularly directed to the identified child instead of to the family. In all three cases, parents were willing to shift their orientation from a child-intervention view to a family-intervention view. This flexibility may also influence the success of this model of intervention. Although the three cases presented a varied economic profile, they had similar ethnic backgrounds. There was variability between the family schema and paradigm in the cases presented, which suggests that application of this model may be successful with many families encountered. All three cases met with success in meeting desired individualized outcomes as articulated in the IFSP.

The professional skills of the interventionist must also be examined. The occupational therapist providing the intervention service had previous training in family-centered intervention strategies. During the first home visit, this therapist provided all parents with verbal acknowledgment of their unique strengths in the interactions with their child. The acknowledgment of parental strengths was the most important aspect in fostering the parent-professional relationship.[6,7] Without a strong sense of respect for the parent's ability, this intervention plan would be difficult, if not impossible, to utilize. Parents then began to identify their successful parenting techniques and to build on these skills. This provided a foundation to support further interventions focused on parent-child interaction. If the interventionist adopts an authority or expert role, it may interfere with the development of parent-child interaction. The service provider utilizing this model of intervention must be comfortable with the parents directing the course of the intervention plan and must actually facilitate this skill within parents who may feel uncomfortable with this role.[6,7]

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The three cases presented illustrate the use of an interactional model of intervention. This interactional model of intervention demonstrates how early intervention can be provided within the context of a family's daily life schedule utilizing the unique strengths and abilities of the family members. The focus of intervention was not limited to improving a specific skill in the infant or child. Instead, the intervention addressed each family member's role development and the interaction of the family members to subsequently improve the child's skills. Through incorporating the family schema and paradigm into the intervention plan, the family identifies important outcomes that foster family interaction instead of focusing on the child's disabilities. Utilizing this model of intervention, the clinician is able to provide family-centered intervention and foster specific skills in the identified child that affect family functioning.

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Infants and Young Children
10(3), 44-53

Weaving Parents into the Fabric of Early Intervention Interdisciplinary Training: How to Integrate and Support Family Involvement in Training

The need to train professionals in the rudiments of interdisciplinary, family-centered care for infants and young children with disabilities and their families has been well documented over the past decade. How best to provide such training has been the focus of the Family-Centered Interdisciplinary Preservice Training Program in Early Intervention at the University of Wisconsin-Madison. This program has a commitment to provide training that fully integrates parent involvement. Student training includes a curricular focus on family-centered early intervention, hands-on activities designed to build interdisciplinary team skills, and an emphasis on providing individualized and diverse opportunities to meet each student's learning objectives. While this training program is multifaceted, this article focuses on one aspect: the utilization of the expertise of parents of young children with special needs as it is woven throughout each training component.

Key words: early intervention, family, family-centered, infant personnel preparation, institutes of higher education, interdisciplinary models in higher education, interdisciplinary personnel preparation, parent-provider collaboration

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PART C (formerly Part H) of the Individuals with Disabilities Education Act (IDEA),[1] has redefined the way in which professionals are asked to work with families. Parents are now recognized partners in policy development, program implementation, training, and the Individualized Family Service Plan (IFSP) process.[2] The principles of family-centered care now stand as one of the cornerstones of the conceptual framework for all early intervention policy and practice. Programs that are committed to a family-centered framework must have a broad base of parent involvement in order to reflect the needs of their consumers.[3] Involving parents of young children with chronic health or developmental concerns in the training of preservice students is critical to ensure that future early intervention providers

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The activities described in this article were supported by personnel preparation grants from the Office of Special Education Programs, US Department of Education (H029Q20110 and H029Q50033). The content of this article does not represent the policy or endorsement of these agencies. We also want to acknowledge and thank the many family members and students who have participated in the training process. We are indebted to the families who have participated in this program.

Reprinted/Adapted with permission from *Infants and Young Children*, Weaving Parents into the Fabric of the Early Intervention Interdisciplinary Training: How to Integrate and Support Family Involvement in Training, Whitehead A, Jensien G, Ulanski B, 10(3)44-53 ©1998 Aspen Publishers, Inc.

are able to implement and uphold the spirit and letter of Part C. Future professionals have much to learn (e.g., delivering information, listening, providing support) from the real experts in a child's life: parents.[4] In order to learn first-hand about family-centered care, students must have access to families in a variety of ways, including occasions to hear the family perspective in courses; time to establish long-term relationships with families; opportunities to work alongside parents; and instances to receive information and feedback from parents regarding their professional development.

Although the training for most disciplines, even those with a focus on families, does not typically include a regular parent presence, the benefits to including parents in training are numerous. The parent presence through guest speakers, constructors, or hosts to home visits provides ongoing opportunities for students to understand families. Parent participation in student learning not only increases understanding but also models skills in developing partnerships with families. Working in partnership with families conveys the message of true collaboration-a message that must be actualized throughout the process, from preservice training to the provision of early intervention services. Dunst, Trivette, and Johanson[5] established that the enabling aspect of partnership is that it builds competencies in those involved as they work together to reach agreed-upon goals.

Experience with families and their concerns, together with didactic sharing of knowledge and the ability to reflect, discuss, and process the issues and challenges of early intervention, is an invaluable asset for a trainee seeking a career in early intervention. This article describes the Family-Centered Interdisciplinary Preservice Training Program in Early Intervention, how families are integrated into all aspects of preservice training, lessons learned in the process, and recommendations to others who may want to adapt or integrate the program practices.

THE PROGRAM

Description and Overview

The Family-Centered Interdisciplinary Training Program in Early Intervention is designed to meet a critical need for early intervention personnel by providing interdisciplinary preservice training to prepare professionals to serve infants, toddlers, and preschool children with disabilities and their families. This two-semester program includes students from the disciplines of nursing, physical therapy, occupational therapy, social work, early childhood education, early childhood special education, and speech and language pathology. (See Table 1.) The three key elements in the design of this program are (1) the involvement of families in all aspects of the training program, (2) a curricular focus on family and professional partnerships, and (3) practical experiences designed to teach optimal interdisciplinary team functioning. These key elements are integrated into all aspects of the training program.

This program is experientially based, providing multiple sites for individualized

Table 1. Student disciplines, [a]

	Discipline						
	Early Childhood special education	**Nursing**	**Occupational therapy**	**Physical therapy**	**Speech language**	**Social work**	**Early childhood education**
Number	8	2	9	2	9	10	2

[a] These students represent two training grants, which students selected from different disciplines.

student learning. Trainees are provided with pertinent experience in the homes of infants and young children with disabilities; the interdisciplinary clinics of the Waisman Center University Affiliated Program (UAP); community-based early intervention programs; early childhood special education programs, neonatal intensive care units (NICUs); inclusive day-care settings; and alternative therapy centers (eg, auditory training, craniosacral therapy). Trainees learn to move from theory to practice as they work with infants, toddlers, and preschoolers with disabilities and their families. Training experiences reflect the shift from a traditional service approach of assessing deficits and prescribing programming to one of providing families with choice-based alternatives in the planning and provision of services. The philosophy of Part C is emphasized throughout the program, although students develop knowledge and skills for both early intervention and early childhood. Specific training activities include the following:

1. observing and participating with families and professionals as they collaborate in the IFSP and/or Individual Education Program (IEP) process
2. participating in a weekly seminar, augmented by readings, courses, and workshops on related topics
3. observing and participating with families as they carry out their regular lives in their homes
4. participating in a small interdisciplinary team of students

Student Composition

The students are primarily seniors or graduate students, many of whom enter the work force upon completion of this program. The program had nine students in each of the first 3 years and expanded to 15 students in the 4th year. Students participating in the program were all females, and the great majority were Caucasian. Table 1 provides information on each cohort of students from 1993 to 1996.

The students represent a wide range of experience and education, ranging from professionals who have been working in the field for 20 years and are returning to get a master's degree, to seniors who have never been exposed to pediatrics. This range in learning and skill level enhances the peer-to-peer learning that occurs. Of the students who participated in the program for these 3 years, two are parents of a child with a disability, and one has a sibling with a disability.

The distribution of students across disciplines is described in Table 1.

Individualized Learning

At the outset of the program, each student completes a self-assessment[6] and an individualized learning plan (ILP).[7] The self-assessment has four content areas: (1) basic early intervention knowledge, (2) family-centered care, (3) cross-cultural issues, and (4) interdisciplinary teaming. Students rate their own knowledge and skill level on a 4-point scale ranging from having no knowledge or no skills to being able to teach the knowledge or demonstrate the skills to others. Based on the completion of the self-assessment, students then complete an ILP. The ILP parallels the IFSP process and gives students an opportunity to reflect on their own learning priorities. Students identify outcomes, strategies to meet those outcomes, resources that they feel they will need, and a time line. The ILP can be updated at any time during the year and guides the types of learning activities in which the student will participate during the training program.

Student Support

Each student is supported on many levels (e.g., emotional, informational, financial) while participating in the program. Student supervision is based on the model of reflective supervision.[8] In the reflective supervision model, parents and professional staff avail themselves to students in much the same way that early intervention providers may avail themselves to families. Just as a service provider comes to understand a family's concerns, priorities, and resources, a supervisor comes to understand the student's individual learning strengths and needs. Through student-initiated, supervisor-facilitated dialogue, the supervisor can enhance the student's knowledge and skills through process-oriented discussions. In this model, the supervisor supports the student by creating a relationship where "Strengths are emphasized while vulnerabilities are partnered."[9(p60)]

The staff use various formats for supervision, while maintaining the reflective supervision model. While supervision is typically one-to-one and single-discipline, cross-discipline and group supervision are also used. In the first several weeks, staff provide same-discipline supervision to enable the students to understand their own discipline's role in early intervention and early childhood. Then all students and supervisors are able to choose additional/alternative formats for supervision. In general, most students choose to continue with the same-discipline supervisor throughout the year. Additionally, the parent facilitator meets two or three times a year with each student or more frequently if needed or requested and provides support as the students process the family mentor experience.

Another form of support is that each student is provided with an annual stipend. This financial support allows full-time students to participate in the training program without having to take a part-time job. This support is an incentive to attract more students into the field of early intervention and early childhood.

PARENT INVOLVEMENT IN ALL PROGRAM COMPONENTS

Staff/Leadership Composition

A first step in weaving parents into this program was to hire parents as staff members. Although funding parent positions as adjunct faculty, coinstructors, or program associates is an ongoing challenge, opportunities are becoming increasingly available. State education agencies and lead agencies for Part C are possible sources of supplemental funds for early intervention and early childhood training programs. State Councils on Developmental Disabilities are another possible source as are local campus undergraduate and graduate teaching improvement grants that are available at many universities. Additionally, with the recent reauthorization of IDEA, the new provision for state improvement grants focusing on personnel preparation could prove to be another source of funds for increasing the meaningful participation of parents in professional development activities.

The parent-faculty relationship models family- provider collaboration, enabling students to arrive at a concrete, rather than just theoretical, understanding of family-centered practices, and infuses a family-centered perspective throughout the curriculum.[10] Of the nine program staff, four are also parents of children with special needs, and one is a sibling of an adult with Down syndrome. The family facilitator position requires a parent of a young child with a disability. This parent is hired to represent the parent perspective in all aspects of the program, as well as build and maintain student family matches (described below). This approach models teaming for the students and ensures that all aspects of the curriculum reflect the input of several parents. In addition to family members on staff, one of the most compelling features of this program is the number of disciplines represented. Program staff represent the following disciplines: nursing, occupational therapy (OT; motor specialist for both OT and physical therapy [PT]), speech-language pathology, special education (education specialist for both general and special early childhood education), social work, and educational psychology. The total staff time on the program is full-time equivalent of 2.45. Staff contribute between 10% and 30% of their time to program-related activities.

Because staff are part time in this program, their other work revolves around direct service to families with children with special needs, through early intervention, clinical practice, and statewide personnel preparation activities. The number of staff available to students, as well as the connectedness of staff to other relevant activities, creates a range of varied resources on which the students may draw. In addition, the interdisciplinary staff continuously models the concept of teaming to the students simply by running the program.

Advisory Committee

Involving families at the policy and program development level is essential to full collaboration in training.[11] In selecting members for the committee, parents of young children with special needs are essential. The parents on the committee represent diverse disabilities, needs, family compositions, socioeconomic backgrounds, and cultures. Most of the committee parents are involved in at least one learning environment (see description below) of the training program. The parent input at the advisory level allows all program materials, curriculum development, and concerns to be channeled through the hearts and minds of those who are on the receiving end of services.

The program advisory committee provides regular feedback on curriculum development and program activities. This committee has broad representation from not only parents but providers in the field, state personnel, faculty, and current and past students. This range of perspectives ensures that the curriculum accurately reflects the needed knowledge and skills in future personnel.

Learning Environments

The program organizes the student learning into four primary learning environments, supported by several teaming activities in each environment. The teaming environments are described below with the parent involvement component highlighted in each.

Community Placement

Creating an opportunity whereby students can be exposed to a large range of children and families and be given a chance to practice skills within those opportunities is crucial for interdisciplinary training.[12] The purpose of the community placement is to provide students with exactly that opportunity. The community placement is not intended to replace fieldwork or practica required in the disciplinary training but to broaden and enhance the students' academic department training. Families and providers in a wide variety of settings have collaborated with this effort by granting their permission to allow students to participate in early intervention home visits, clinic evaluations, itinerant services to day-care centers, Head Start, public school early childhood programs, and other settings where young children spend time.

Each student is matched with a community provider who is working with families who have children with special needs, ages birth through 5. The match is made according to the learning outcomes identified by the student in the ILP (eg, a student who has only had experience in early childhood might be placed with a birth-to-3 program). Students have between one and four regular community placements over the course of the training program, and several one-time visits to a variety of sites, such as an NICU or early childhood program. In the regular community placement, the student and provider spend an average of 2 hours together each week. The student is expected to move from observation to practice in each setting, as the year progresses.

Seminar

Seminar affords many opportunities for parent involvement in preservice training. The value and importance of including parents in preservice training activities such as panels and lectures have been well documented.[13,14] The benefit of expanding didactic teaching with personal, "real life" family stories and viewpoints has been highly rated by students and parent/professional instructors. Students reflect positively on the opportunity to listen as parents share stories about their experiences in parenting their young children with special needs. Family stories provide the opportunity for shared perspective and the ability to discuss and reflect on one's own understanding of parent-professional partnerships.[15]

The seminar learning environment provides early intervention knowledge, enhances student skills, and offers a safe environment to process the many learning experiences from the program. Parents from a wide range of backgrounds and experiences are regularly invited to seminar to tell their family story, participate in a panel on a specific topic, or simply join in the discussion by offering the parent perspective.

All program students and several staff meet for 2 hours each week for the seminar. The curriculum begins with the concept of family-centered care and moves through the chronological stages that a family would go through while receiving services (eg, identification, assessment, IFSP development, transition). The fall semester focuses on conceptual knowledge, while the spring semester concentrates on early intervention skill development (eg, conducting family interviews, completing an assessment, transition planning). Students move from theory to practice as the year progresses.

As a supplement to seminar, students receive a wealth of information, in the form of parent-written poems and stories, journal articles, book chapters, videos, copies of the law, and regulations. Students are exposed to electronic resources such as the Internet and World Wide Web. Students are required to spend 15 hours a semester attending parent and/or professionally focused workshops, conferences, and/or courses relevant to the field of early intervention and early childhood.

Family Mentorship

While consistent parent participation in seminar is beneficial and beyond many traditional disciplinary training experiences, program staff considered what further steps might be taken to develop more far-reaching efforts at partnership. Parent-professional collaboration in preservice training must go beyond asking parents to participate in panel discussions and sharing family stories.[16] Training Programs in which parents and professionals collaborate in more than one learning environment make partnership a reality to students.

This family mentor learning environment provides the students the opportunity to understand the service delivery system from the family perspective. Through the generosity of local families, who open their homes and lives to students, each student is matched with a family who has a young child with special needs for the duration of the training program. The student and family are matched by the family facilitator, according to student interest, past experience, learning needs, scheduling, and family preferences.

Cooperating families meet prior to the assignment of students for a detailed orientation on the purpose of the experience, the range of possible activities, and procedures for addressing problems, if they arise. Families also meet periodically with program staff throughout the year to share observations, address issues of concern, and assess the utility of activities for families and students. These group opportunities are augmented by regular contacts with the family facilitator to implement a proactive approach to supporting family-student matches. A *Family Mentor Handbook*[17] is provided to each student and family, so that expectations and learning activity suggestions are clearly outlined.

The student and family spend an average of 2 hours together each week (approximately 60 hours for the year). The time spent together is individually determined, though students are strongly encouraged to engage in a wide variety of learning activities ranging from attending physicians' appointments to providing respite. This learning environment provides students with a series of concrete experiences in the challenges and rewards that families with young children with disabilities face and the daily routines in their lives. This experience is key for students to gain competencies in family-centered care. Through this experience, students are sensitized to the roller-coaster (abundance or dearth) of information, personnel, resources, and emotions that cycle in and out of the lives of families.

The Interdisciplinary Team

Legislation and best practice require that those who work in early intervention face the issues of family-centered care and interdisciplinary teamwork on a daily basis. New practitioners are expected to have the skills to work as effective team members, the ability to collaborate with families, and knowledge of early intervention policy and legislation. In addition to skills and knowledge, it is expected that practitioners share values about early intervention goals and the means to achieve them, as well as the skills, support, and insight to recognize when their values may conflict with others'.[18]

The interdisciplinary team learning environment provides the students with the experience of working on an interdisciplinary team with a family to develop an IFSP. Families from the Madison Early Intervention Program or Early Childhood Program agree to complete a mock IFSP activity with the students. Each student is placed in a small, interdisciplinary group with other training program students and a family with a young child with chronic health or developmental concerns. The small groups meet for 2 hours a week for the spring semester and complete a number of learning activities with the family to work through the various phases of the IFSP process. At the completion of this process, the students and family deliver a presentation to the entire training program group, focusing on the information, skills, and lessons learned from this activity. Table 2 provides specific examples of student activity and participation in each learning environment.

Summary

The benefit of these four learning environments s that students continuously interact with families in real-world environments and see the costs and benefits of the service delivery system to the families they will serve. Students come to fathom the strength and resiliency of families with young children with special needs.

LESSONS LEARNED

Outcomes

While all of the program's curricular components are evaluated, this article focuses on the parent involvement component. It is important to point out that while several formal evaluation instruments are used, regular, ongoing feedback is very useful in gauging the "pulse" of learning progress for the students as a group and individually. This section describes one instrument used to evaluate the program and document student satisfaction and presents the results from the various phases of data collection. The Trainee Program Evaluation Questionnaire was developed to provide feedback to program staff at midterm and end of the year regarding trainees' perceptions of group work, the different learning experiences, and other aspects of the training program. The questionnaire is a combination of qualitative

Table 2. Learning environments and activities

Community Placement	Seminar	Family Mentor	Interdisciplinary Team
Therapy	Family-centered care	Therapy session	Discipline interviews
Intake	Interdisciplinary teaming	Doctor visit	Book review
Play-based assessment	Cross-cultural issues	Dinner	Report critique
NICU visit	Early intervention knowledge	Birthday party	Play-based assessment
Transition	IFSP process	Technology-dependent Evaluation	Team process reflection
IFSP/IEP meeting		Transition meeting	Team goal-setting
Staff meeting		IFSP/IEP meeting	Mock IFSP
Home visit		Swimming	Literature reviews
Inclusive center		Respite	

Table 3. Trainee evaluation: mean rating for helpfulness of parent involvement in program components

	Year		
Program component	**1994** **n = 9**	**1995** **n = 9**	**1996** **n = 15**
Community placement (home visits)[a]	4.80b	4.66	4.55
Seminar (parent perspective)[a]	—	4.55	4.67
Family mentorship	4.67	4.55	4.57
Interdisciplinary team IFSP activity)	5.00	5.00	4.67
Parents as part of the program staff	4.67	4.00	4.47

[a] Collectively, the students participate in over 25 community placements and seminars. For the purposes of this article, one type of community placement-home visits-and one seminar that consistently included a parent panel are highlighted to represent the feedback in these two learning environments.

[b] For the rating scale, 1 = least helpful and 5 = most helpful.

and quantitative questions. This formative evaluation input helps to alert program staff to needed adjustments in either the content, level of difficulty, or pace of training experiences. The questionnaire is quite lengthy, so for the purposes of this article, data directly relevant to parent involvement in the program have been extracted.

Table 3 presents quantitative results from this questionnaire, when it was administered at the close of the training program, for the past 3 years. The results focus on the four learning environments and student satisfaction with parent involvement in the program's training components. The numerical results summarized in Table 3 are mean ratings based on a 1 to 5 rating scale, where 1 indicates that the item was least helpful, and 5 indicates that the item was most helpful to student learning.

Reflections

One of the more compelling and consistent findings across all evaluation data was the positive regard students expressed toward their contact with parents of children with disabilities. This was evident in their very high ratings of the family mentor experience, parent panels, and the presence of parents as members of the interdisciplinary staff. Students' comments included statements such as, "I'm so impressed how much they opened up to us. I learned so many new things!" and "The more opinions I heard, the more my family-centered perspective grew ... and more a part of my thinking." Student comments indicated that they had few opportunities in their previous training to interact with parents and families and that it was precisely these experiences that provided the necessary knowledge and, maybe more importantly, the confidence to act as competent professionals.

Another important lesson or realization acquired by program staff was the needed balance between advancing a family-centered framework and attitudes and yet, at the same time, allowing students to express their true feelings about parents, their relations with them, and their concerns as they arose. Staff were careful to create an open and safe forum for the expression of feelings. When statements or expressions of concerns about families were made that may have been overly judgmental or prejudicial, staff reflected on what might be going on with a family or the struggle that a family was facing, asked for other opinions from students, or explored alternative explanations for the behavior or issue under discussion. Staff worked to provide a nonjudgmental reflection of what students were saying and experiencing and yet to lead them to at least explore interpretations that were family-centered.

Summary of Benefits

In reviewing student end-of-the-year comments, the program is very successful in meeting students' needs and in providing them a sense of a solid preparation in essential skills, as well as the emotional demands of their upcoming jobs. Throughout the year, students participate in a broad range of experiences with parents of children with special needs, in a variety of settings, in association with professionals from different disciplines. Students work on relevant tasks that meet the needs of children and families in community placements. Students also have the critical experience of teaming with parents as both learners and service recipients in their weekly experiences. The year-long relationships established with mentor families provide a long-term vehicle for professional learning and personal growth. Students immediately apply theoretical knowledge to real life situations and have the sense that they are also doing meaningful and relevant work.

RECOMMENDATIONS

Based on data collected and reflections of program staff, the following recommendations are offered for other programs that may want to involve parents in an interdisciplinary training program in early intervention:

1. Employ a parent of a child with a disability as a member of the core instructional team. The consistent and regular presence of a parent at planning meetings, supervision activities, and seminars shapes the entire complexion of a training program and adds a note of reality and comprehensiveness that cannot be attained without his or her presence.
2. Ensure that parent representation on the advisory committee is diverse in terms of disabilities represented, ages of child(ren), cultural backgrounds, and family composition. Some ways to support family involvement include the following: provide child care, hold meetings at a time convenient to families, provide parking, and/or offer an honorarium.
3. Look for ways for each student to have access to many families so that she or he can see the range of individual family differences. This can be accomplished through a community placement program. Another way to multiply the student's experiences is to make a commitment to have students share their experiences during seminars.
4. Invite parents to class or seminar on a regular basis. The parents can speak on whatever topic is scheduled. Have a parent share in a discussion of the readings to enhance the breadth of the learning. It also teaches students to talk freely with family members.
5. Invest the time and energy in creating an effective family mentoring program. Auxiliary materials such as the *Family Mentor Hand-book*[17] and activities such as a mentor family orientation and year-end summation meeting are well worth the time and effort for the benefits that accrue to students and the program in general.
6. Keep in regular contact with the families "in the field." It is through building a relationship that you will know if the program is meeting the needs of all involved.
7. Hold a weekly coordination meeting of training program staff to review ongoing activities, ensure that coordinated plans are made for future activities, brainstorm solutions to problems or challenges that arise, and have the opportunity to build the instruction team into an effective working entity.

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ASSISTIVE TECHNOLOGY SUPPORTS

Toys are the tools that children use to play. Although play has the potential to make a strong and positive impact on growth, frustration can ensue when toys are too difficult to locate or to operate. This is often the case for children with disabilities. Toys can become an obstacle to learning rather then a facilitator of the process. Other play barriers may include an inability to move or position oneself in order to explore objects in a variety of ways, or difficulty seeing and hearing the results of playful interactions.

In investigating strategies which can augment existing play abilities or compensate for limitations imposed by disabilities, assistive technology (AT) interventions have been reported to extend the play repertoires and play interactivity of infants and toddlers with disabilities. The use of "low-tech" AT solutions are most often chosen as they are readily available, inexpensive and offer a wide range of options for families. Several categories of AT can be used in combination to create interactive play environments unique to each family's needs. They include: 1) adapted and specialized toys, switches, and computers; 2) positioning and mobility items and 3) communication devices.

The role of the family in the selection of the AT is critical to a successful experience. Family values, their perceptions of the child's abilities and behaviors, their play preferences as well as other home life information, greatly impact how and what is used. The following articles reflect the growing recognition of how a broad range of AT can be applied to meet the needs of young children with disabilities and their families.

Focus on Autism and Other Developmental Disabilities
11(2), 86-95

A Home-Centered Approach to Assistive Technology Provision for Young Children with Disabilities

Mary Jane Brotherson, Christine C. Cook, and Howard P. Parette, Jr.

This article discusses a home-centered approach to the use of assistive technology. A home-centered approach essentially addresses two questions: (a) How can assistive technology interventions for children with disabilities be implemented successfully in the home environment? and (b) How can the family system be considered in the use of assistive technology in the home environment? This article helps answer these questions by reviewing the literature in two encompassing areas: children's home environment and self-determination, and family systems and assistive technology. The first area examines the home as the primary learning environment for children and how the home environment can contribute to the development of skills. The second area discusses how family culture, resources, interactions, and goals for the future must be considered if assistive technology is to be successful in the home environment. The article provides a discussion of suggestions for working with families in the process of identifying and providing assistive technologies for young children in the home environment.

Individualized Family Service Plans (IFSPs) and Individualized Education Programs (IEPs) frequently mandate provision of assistive technologies to young children with disabilities (Behrmann, Jones, & Wilds, 1989; Parette & VanBiervliet, 1991; Parette, Hofmann, & VanBiervliet, 1994). These plans often identify assistive technologies such as mobility devices, positioning equipment, augmentative and alternative communication (AAC) devices, adaptive toys, and environmental control systems (Church & Glennen, 1992).

Family input is always key to assessment and delivery of services, and is particularly important for decision making about assistive technology. Although faculty members and an educational team of professionals typically collaborate to identify appropriate technologies (Parette, Hourcade, & VanBiervliet, 1993), a program plan will be effective only if family issues have been considered (Angelo, in press; Brinker, Seifer, & Sameroff, 1994; Condry, 1989; Gallimore, Weisner, Bernheimer, Guthrie, & Nihira, 1993; Parette, 1994b; Parette & Angelo, in press). These family issues include an understanding of the values, culture, interactions, and resources of the family, including the *physical context* in which the assistive technology will be employed.

This article describes a home-centered approach to the use of assistive technology that is sensitive to both the physical and social characteristics of the home environment. It is based on a review of the literature in two areas: (a) children's home environments and self-determination; and (b) family systems and assistive technology. In addition, this work draws on the experiences and research of the authors in examining adaptive environments for young children with disabilities and their families. Following a review of the literature, suggestions are offered for implementing a home-centered approach for the use of assistive technology.

The focus of the discussion is on practical application of research to home environments for children with disabilities. *Home* is viewed as a primary and continuing learning environment for children. Families are seen as the constant support in the lives of children. A home-centered approach to assistive technology essentially asks two questions: (a) How can assistive technology interventions for children with disabilities be implemented successfully in the home environment? and (b) How can the family system be considered in the use of assistive technology in the home environment? Implementing technology-based interventions in the lives of children with disabilities requires the integration of assistive technology into existing activities and spaces within the home and into the values, culture, interactions, and resources of the family (Harry et al., 1995; Soto, 1994).

ASSISTIVE TECHNOLOGY IN THE HOME

Children's Home Environments and Self-Determination

The home environment is composed of two important elements: the physical environment, consisting of the attributes of the house and neighborhood, and the social environment, including the family system, friends, and neighbors (Wachs, 1989). Viewed as physical space, children's homes are a complex system of rooms and spaces, furnishings and equipment, storage and displays, and the connections between them. As a social environment, children's homes are the center of the family's culture and interactions, and the hub that connects families to the community. The use of assistive technology in the home is influenced by both physical and social elements (Sowers, 1995).

Early research on home environments has focused primarily on the social environment (Wachs, 1989; Wohlwill & Heft, 1987). Though more recent attention has been directed toward children's physical environments (Parette & Murdick, 1994), its importance is often overlooked (David & Weinstein, 1987). From early childhood through adulthood, the physical environment can promote or discourage opportunities for personal development, family interactions, and welcoming friends. Physical limitations of the home environment (e.g., entranceways too narrow to accommodate a wheelchair or clothing placed out of children's sight or reach) can restrict important opportunities to explore, to choose, and to make one's own decisions. Assistive technology has the potential to reduce daily physical limitations in the home and increase the functional abilities of the child with disabilities (Hirschlein, 1989; Rothstein & Everson, 1995).

Family expectations regarding how the home environment is to be used may stymie children's development and use of assistive technology (Gaunt, 1980; Johnson, 1987; Lewis, 1986). Johnson (1987) has proposed that the home environment of children is one of the most restrictive that they encounter. She has recommended that homes be redesigned to include (a) play areas in the main living areas of the home and in the kitchen, (b) improved access to the household through scale and positioning of various fixtures, and (c) consideration of both privacy and active play needs within the home. It is through play that young children acquire social, cognitive, and physical skills (Linder, 1993). Gaunt (1980) has argued that restriction of children's play behavior hampers the developmental process and is not conducive to healthy development.

Furthermore, there is evidence that the meaning a person attributes to home can influence the adoption of assistive technology. For example, Hovey (1993) and Lang and Sullivan (1986) reported that families are reluctant to renovate homes in such a way as to advertise the presence of a person with a disability. They found that wheelchair ramps into the home were likely to be found in the garage and at the back door rather than at the home's front entrance. A ramp is like "a neon sign saying I have a kid with a problem" (Hovey, 1993, p. 50). Similarly, Cook, Brotherson, Weigel-Garrey, and Mize (in press) found that parents of young children with mobility impairments restricted the use of wheel-chairs and walkers, placing them on porches and in garages rather than permitting their use inside the home.

Assistive technology interventions for children with disabilities can be more successfully implemented in the home environment by attending closely to the characteristics of the physical environment, including its routine use and the meaning that the family attaches to the home. Without an assessment of the home environment, *technology abandonment* may occur (Behrmann, 1995; Parette & Angelo, in press). Technology abandonment has been described as a process in which an assistive device is (a) provided subsequent to an evaluation or personal selection process, (b) used until it is recognized that it fails to meet the needs of the child, and (c) abandoned due to dissatisfaction (Batavia, Dillard, & Phillips, n.d.; Batavia & Hammer, 1989). Family members have sometimes been blamed for relegating equipment to closets, attics, and basements (Phillips, 1993). It is likely, however, that technology abandonment is indicative of failure to take into account both the physical and social components of the home environments prior to the development and implementation of intervention strategies.

Self-determination for children with disabilities has received a great deal of attention in the professional literature (Abery, 1994; Schloss, Alper, & Jayne, 1994; Ward, 1991; Wehmeyer, 1992). It has been defined as the ability to consider options and make appropriate choices regarding home, work, and community life (Schloss et al., 1994; Shevin & Klein, 1984; Wehmeyer, 1992). The home setting is the environment where most children begin to learn to make decisions and define goals for themselves. Exhibiting skills of choice and decision making "reflect favorably upon one's perceived independence, dignity, and self-worth" (Guess, Benson, & Siegal-Causey, 1985, p. 79). The development of these skills begins early at home and extends throughout adulthood and into later life (Ward, 1991; Wehmeyer, 1992).

Largely ignored in the literature are discussions focusing on opportunities in the home environment to develop skills leading to self-determination (Brotherson, Cook, Cunconan-Lahr & Wehmeyer, 1995). The home offers unlimited opportunities for young children with disabilities to plan, initiate, and direct activity. Cook et al. (in press) examined the home environment using an environmental checklist that examined seven indicators drawn from research described by Miller (1986) regarding how assistive technology could enhance self-determination in the home: nurturance, territory, identity, stimulation, manipulation, privacy, and socialization. For example, pets can provide stimulation for a child with disabilities in the home. Thus, assistive technology team members might consider how an adapted feeding device allows a child with disabilities to assume the family chore of feeding the dog or cat. Another issue that might be posed to team members is how assistive technology can be used to give a child greater opportunity to socialize with friends.

Often, assistive technology brings to mind "high-tech" solutions (i.e., speech synthesizers, communication boards, powered wheelchairs), but in families, "low-tech" solutions often provide simpler, less expensive, less complex, and less stigmatizing solutions. For example, some low-tech devices used by families to support the development of their children with disabilities include (a) full-length mirrors positioned low and horizontally to allow for a child's eye view, (b) clothes in bins on the floor to facilitate selection, (c) jewelry clay used to make a spoon easier to grasp, (d) large bells added to a basketball hoop to assist in hearing a successful shot, and (e) motorized toy cars for self-initiated movement outdoors (Cook et al., in press).

A child's level of communication, social skills, and motor abilities can influence his or her ability to consider options and make choices. Some homes, however, are notable for the lack of accommodation for their child with disabilities regardless of type of disability. Although most families are advocates of increased choices and opportunities for their children with disabilities, their understanding of the role of the home environment is limited. Cook et al. (in press) interviewed 12 families of children with various disabilities ages 3 to 8 and found varied or limited accommodations and use of assistive technology. Others have found that family members report many unmet needs for home-related assistive technologies (Parette & VanBiervliet, 1990).

Regardless of the range of opportunities for development of self-determination skills in the home, there is agreement among families that assistance from professionals has been limited. Educators are often unaware of or untrained in the use of assistive technology to support the development of self-determination for children in home or school environments (Houghton, Bronicki, & Guess, 1987). Although much of the literature in early childhood focuses on family-centered intervention (Mahoney, O'Sullivan, & Dennebaum, 1990; McBride, Brotherson, Joanning, Widdon, Demmitt, 1993) and, more recently, on the development of self-determination skills (Martin, Marshall, & Maxson, 1993; Wehmeyer, 1994), surprisingly little attention has been paid to the homes in which these strategies are implemented and the early opportunities for these skills to be developed.

Family Systems and Assistive Technology

Family-centered early intervention services have the potential to positively affect family functioning, parental coping, and caregiving effectiveness (Mahoney et al., 1990). A recent survey of state P. L. 100-407 (Technology-Related Assistance for Individuals with Disabilities Act of 1988) programs suggested that less consideration was given to family system issues by related services personnel than to technology, child, and service system issues (Parette, 1994a; Parette, VanBiervliet, & Bradley, 1994). Consideration of family system issues is critical to the use of assistive technology in the home environment because parents and family members do not always share the same concerns or preferences as related services personnel (Angelo, in press; Beukelman & Mirenda, 1992; Parette & Brotherson, in press).

Family culture, interactions, resources, and goals for the future must also be considered if service plan implementation is to be effective (Angelo, in press; Condry, 1989; Gallimore et al., 1993). A family's culture, for example, can affect how the family perceives and defines disability, and cultural values held by families may coincide or conflict with assistive device usage (Luborsky, 1993; Smith-Lewis, 1992; Sontag & Schact, 1994). Smith-Lewis (1992) reported that African American and Hispanic American family members of children with severe disabilities often resisted the use of augmentative and alternative communication devices because they perceive such systems as unnatural and more stigmatizing than spontaneous communication efforts.

Family values and the influence of social factors have also been shown to exert an influence on family decisions to use assistive devices. A study by Brotherson, Oakland, Secrist-Mertz, Litchfield, and Larson (1995) identified two major perceptions that influenced the family decision to use a feeding (gastrostomy) tube for their child with disabilities. The first was the family's need to see and maintain themselves as normally as possible. The second was the need to reduce the visibility of the disability. Having a feeding tube attached to their child increased the visibility of their child's disability; it was important for them to reduce this visibility.

Families must sometimes choose between assistive devices that require additional parent responsibilities (and changes in family routines) and quality of life for the entire family (Allaire, Gressard, Blackman, & Hostler, 1991; Angelo, in press; Brotherson et al., 1995; Culp, 1987; Culp, Ambrosi, Berniger, & Mitchell, 1986). In the study by Brotherson et al., parents who made the decision to place a feeding tube into their child were faced with a difficult balance of family needs. A feeding tube meant adequate nutrition, reduced illnesses, and increased interactions for their child. But it also meant fewer extended family members who would help feed, greater family isolation, and greater financial stress for the family.

Studies have also shown that increased levels of stress may occur if (a) increased caregiving demands are placed on families (Haddad, 1992; Harris, 1988); (b) additional time is required for family members to provide intervention services (Brotherson & Goldstein, 1992; Brotherson. et al., 1995); and (c) new devices are introduced into the family routine (Angelo, Jones, & Kokaska, 1995; Donahue-Kilburg, 1992). Failure to consider family system issues when introducing assistive technology into the home can result in the prescription of a device that may not be used and a wasteful use of family, as well as system, resources.

Home-Centered Approach to Assistive Technology

To insure that consideration is given to the physical and social aspects of the home environment during IFSP and IEP processes, professionals must ask parents sensitive family-centered questions prior to prescribing assistive technologies in the home (Angelo & Parette, 1995; Parette & Brotherson, in press). Although previous attempts have been made to guide decision-making processes for assistive technology teams (Mann & Lane, 1991; Parette et al., 1993; Parette & VanBiervliet, 1991), these guidelines have not discussed decision making from a family systems perspective.

The first step in selecting assistive technology is an assessment of child needs and a survey of family needs and priorities. A family-centered interview or conversation can help identify unique family issues. Good communication skills are critical to understanding the culture, needs, values, and priorities of family members (Lynch & Hanson, 1992; Winton & Bailey, 1988). Ideally, a visit to the family's home could lead to a clearer understanding of the home environment and the family needs within that environment. If this is not possible, then the family and team could collaborate with someone who has already been in the family's home (e.g., an occupational therapist or early interventionist). The use of photographs or a videotape of the home environment could also provide the team with a clearer understanding of the home setting and challenges it might pose to a child, such as limited space for storage, narrow entryways, or high counters.

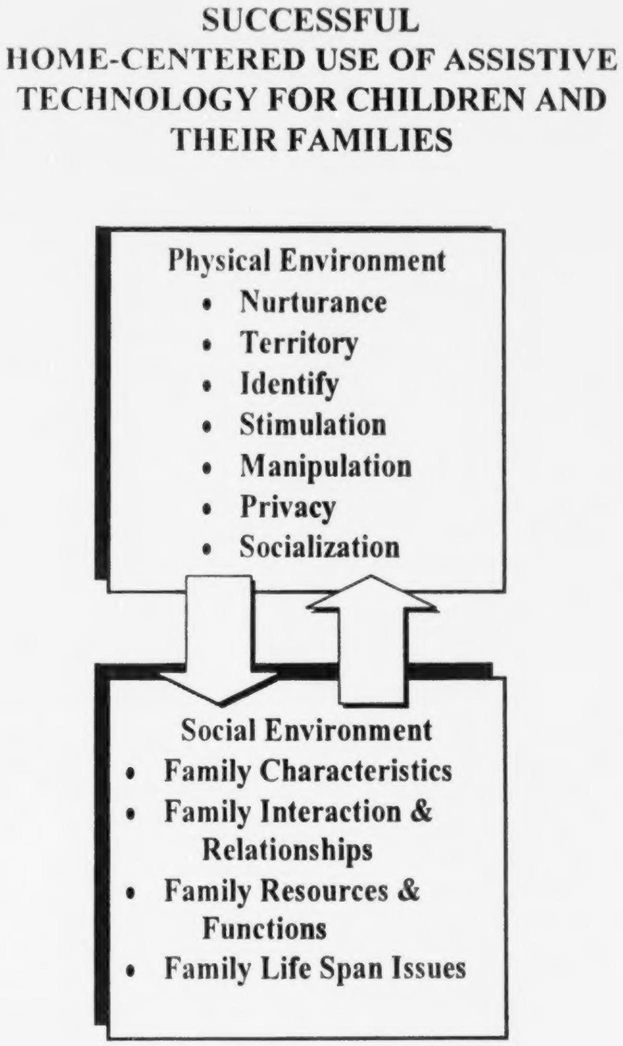
SUCCESSFUL HOME-CENTERED USE OF ASSISTIVE TECHNOLOGY FOR CHILDREN AND THEIR FAMILIES
Physical Environment
• Nurturance
• Territory
• Identify
• Stimulation
• Manipulation
• Privacy
• Socialization
Social Environment
• Family Characteristics
• Family Interaction & Relationships
• Family Resources & Functions
• Family Life Span Issues

FIGURE 1. Home centered approach to providing appropriate assistive technology.

The following is a discussion of suggestions for working with families in the process of identifying and providing assistive technologies to young children in the home environment. Questions are presented that can help provide a road map for more effective assistive technology decision making in the home, taking into account both the physical and social environments (see Figure 1). The section is divided into sets of questions: (a) those related to examining the physical environment and its relationship to the seven environment and its relationship to the seven indicators, and (b) those related to family issues in the use of assistive technology and devices in the home.

Physical Environment

Assistive technology is defined in the Individuals with Disabilities Education Act of 1990 (IDEA) as "any item, piece of equipment or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities" [20 U.S.C. Chap. 33, Sec. 1401 (25)]. This definition is broad and includes devices ranging from low-technology to high-technology solutions that could be helpful to families. Often, the use of low technology can be more appealing to families because it is less expensive and less complex for families to incorporate into family life (Cook et al., in press). The following examines how seven indicators of child development can be enhanced by the use of both low and high technology in the home. This list of examples is not exhaustive, but rather is included to facilitate creative solutions and suggestions for the use of assistive technology in the home.

Nurturance. How nurturing is the home environment? Places that children call warm, comfortable, snug, and "soft" are nurturing (Cook et al., in press; Prescott, 1978). Light, temperature, color, texture, room arrangement, and furniture selection and placement can enhance the child's feelings of being safe and secure. Examples include chairs arranged for conversation, including a child's own chair, and displays of family photographs and children's artwork. Professionals should observe efforts to make a nuturing home environment such as (a) family photographs displayed that include the child with a disability, (b) children's art displayed at child's eye level, (c) child-sized furnishings available, and (d) pillows, boxes, or cushions available to be moved to create snug spaces.

How can opportunities for nurturance be created or increased by using assistive devices in the home? For example, maintaining a display of artwork or family pictures at the child's level may be difficult with a child who is hyperactive. This might be accomplished with a large piece of Plexiglas attached to the wall over an assortment of pictures and artwork. Large styrofoam blocks covered with cloth make very movable boxes for creating snug spaces.

Territory. How is a child's desire to own, control, and occupy space accommodated? Territorial behavior is defined as claiming control over a particular area (Sebba & Churchman, 1983). Children sometimes control a bedroom or a portion of a shared bedroom, or out-of-the-way places such as attics, storage areas, garages, and corners. For children with physical disabilities, a control nest (Lawton, 1990) can be delineated by a chair or space on the floor from which a child can see much of the activity of the home, has a view of the outside, and can reach favorite toys or regulate stimulation (e.g., from a TV, VCR, or a cassette player). When making observations in the home setting, professionals should note whether the child has (a) a designated chair or place in the living or family room, (b) a designated place at the dining and/or kitchen table, (c) a child's play area, and (d) opportunities to regulate the sound and lighting in the child's spaces.

How can opportunities for territory be created or increased by assistive technology? Does the child have specific spaces that are his or hers? It may be that assistive devices make it easier for a child to control and regulate his or her favorite music. It may also be that a home mobility device, such as a scooter board, makes it easier for a child with physical limitations to move into an out-of-the-way closet or corner.

Identity. Does the home environment encourage the development of identity? The home plays a very important role in the development of a clear and stable definition of self (Miller, 1986). Children should have their identity reflected in their surroundings and they should enjoy some freedom to express their identity through the personalization of space. Placing one's own identity in a space can help develop identity apart from parents and give children a feeling of status or self-worth in the family (Miller, 1986). Specific indicators that professionals might observe include whether the child has (a) opportunities to choose the color or furnishing in his or her bedroom, (b) a full-length mirror at child height, (c) personal space for play or privacy (e.g., behind couch, in closet, tent), or (d) photographs of the child with the people or things he or she enjoys.

How can opportunities for identity be increased by using assistive technology or devices? For a child with autism or other developmental disabilities, identity may be expressed by a personalized space where everything remains constant, without change in that space. Using a mirror with a child with autism may pose a safety concern. A simple assistive device, such as a metal mirror or larger security brackets to hold the mirror in place, may help make this available.

Stimulation. Is the environment stimulating? Everything in the home setting provides stimulation for young children, ranging from windows, decor, plants, pets, books, and wall displays to the auditory stimulation of the television, stereo, and radio. Professionals conducting observations of the environment should determine whether the child has (a) adequate room available to explore, (b) windows to view the outdoors, (c) permission to use his or her wheelchair or other special equipment indoors, (d) pet(s) in the home, or (e) children's books and toys available.

How can opportunities for stimulation be created or increased by using assistive technology or devices? This may include adapting toys or books so that they can be easily used. It might also include inexpensive plastic piping or tubing positioned on the floor against the walls to minimize damage and allow greater use of wheelchairs or walkers in the home (Cook et al., in press).

Manipulation. Can the environment be manipulated by the child? Children derive satisfaction from actively shaping and changing the environment. Children's home environments may not have specific areas set aside for children's different play activities. Different kinds of "adult decorations" that are "off-limits" to children have been observed more frequently than different kinds of toys and educational materials for children (Clarke-Stewart, 1986, p. 35). Professionals might observe whether the following indicators are present in the home: (a) low shelves and drawers that make clothes, toys, and household items accessible; (b) opportunities to engage in large-motor activities; (c) movable furnishings, toys, and books; and (d) safety modifications to steep stairs and other hazards.

These indicators may be increased by using assistive devices that allow the child to participate in daily family activities and chores (e.g., adapted cooking devices, adapted pet feeding device). Certain drawers, shelves, or cupboards might also be made accessible with adapted pulls, glides, and latches to allow for greater choice and manipulation. Toys and books can be made movable by storing them on low shelves with high-quality coasters.

Privacy. How can the child achieve and regulate privacy? Privacy is perhaps the most important dimension in the development of self-identity and autonomy because it involves setting up and controlling boundaries between the self and others (Laufer & Wolfe, 1977). However, children are often subject to intrusion in the home setting (Proshansky & Fabian, 1987). Providing the child control over access might take the form of a closed door, a private drawer, one's own chair or room, a small, quiet area away from family activity, or headphones for a cassette recorder (Dodge, Koralek, & Pizzolongo, 1989). Professionals might observe whether the child (a) has a bedroom or designated portion of bedroom; (b) can close the bathroom and bedroom doors; (c) has a tent, cubby, closet, or other designated retreat; and (d) can use headphones for private listening.

How can opportunities for privacy be created or increased by using assistive technology or devices? This may mean, for example, adapting a toilet so that a child can use the toilet without assistance, or allowing a child to turn off his or her hearing aid at times of chosen privacy. Door latches instead of doorknobs can make opening and closing bathroom and bedroom doors easier.

Socialization. Is the home arranged to accommodate interaction with family and friends? The contribution of the family to social interaction and friendship formation among children with disabilities has been discussed less frequently than socialization in classroom settings (Buysse, 1993; Levitt & Weber, 1989; Peterson & McConnell, 1993). The skills related to social interaction begin at home by inviting friends to play and by sharing living quarters and activities with family members (Miller, 1986).

Professionals could observe to see if the following indicators are present: (a) child-sized table and chairs; (b) accessible toys, games, and/or materials; (c) indoor play spaces that accommodate the child with disabilities and other children; and (d) outdoor access to safe out-door play spaces.

Can opportunities for socialization be created or increased by using assistive devices? This may include adapting toys or communication boards so that friends can also use them together. It might include a playground device that allows the child with a disability to play in the sandbox or on the swingset with his or her friends. A smallpaved or blacktop area in the yard can be very inviting for motorized toys or chalk play.

Social Component of the Home Environment

Successfully family life requires that the needs of all family members be understood and addressed (Turnbull, Summers, & Brotherson, 1986). Family and friends are important participants in decision-making processes to determine what assistive technology devices can be successful for a child with disabilities within the home environment. They are also important for identifying priorities for those technologies and devices and determining how they mesh with the belief systems, interactions, routines, strengths, and dreams of the family. Change in any one part of the family system can affect the entire family system. Sometimes these changes are direct (e.g., giving a child greater control to regulate the stereo in the home can intrude on the auditory space of family members), while at other times the effects on the family members are indirect (e.g., a communication board often alters the ways in which family members interact with each other).

The family system exists in a broader social context or social environment (Bronfenbrenner, 1979). The family system is nested in and interacts with neighbors, extended family, friends, co-workers, and community groups, as well as formal service providers. The use of assistive technology can change the family's social environment in positive or negative ways. A new wheelchair for the child with disabilities could result in increased opportunities for the family to join in on community activities. Problems with transportation of the wheelchair or inaccessible homes of family friends could lead to greater social isolation.

Presented in Table 1 is a series of questions in four areas that provide an initial framework for helping families examine what assistive technologies and devices are needed in their family and how these can fit into the family's life and home. These questions are extensive and can be used in segments as new issues or needs present themselves to the family. Providers might choose questions to assist the family in identifying barriers and supports to using assistive technology or devices. Another strategy that might be used to help families incorporate the use of assistive technology into the home is a family problem-solving approach. Table 2 lists the steps of the problem-solving process, adapted from Brotherson and McBride (1992). Use of a problem-solving approach could assist the intervention team and the family in (a) negotiating a trial use of a device, (b) examining the impact of a device on the family, and (c) establishing when and how to evaluate the use of assistive technology.

Summary

All children, including those with autism and other developmental disabilities, should be given opportunities to develop the attitudes, abilities, and skills to take control over their lives. One of the most important environments where this begins for the child is in his or her

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TABLE 1

Home-Centered Questions to Facilitate the Identification of Assistive Technology for Young Children with Disabilities

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Influence of family characteristics (culture, values, and needs):

What are your child's needs and preferences for technology?
What are your family's desires and needs for technology?
What has been done in the past to meet your child's needs and how was this successful?
Do you perceive that the technology makes your child or family more visibly disabled?
How, if at all, might the technology improve your family's quality of life?
How will this device help your child to be part of your normal family life?
Can you describe any barriers your family might experience in using this technology?
How, if at all, is this device in harmony with your family values or culture?
Will the use of the technology give your child greater access to his or her environment?
What, if anything, is there about this device that concerns or frightens you?

Impact on family interactions and relationships:

What persons in your family do you want consulted about technology decisions?
Who in the family will be able to comfortably use the technology?
How easy will it be to take care of the device from day to day?
How easy will it be to repair the device?
Will you have to train friends or anyone in your extended family to use the technology?
How will use of the technology change or disrupt your family routine?
How will the technology add tasks to your family routine (e.g., battery charge, cleaning)?
How will it increase or decrease caregiving demands for any one family member?
Will use of the technology make it easier for your child to interact with friends and family?
How, if at all, will siblings have to change to be able to use this device?

Impact on family resources and functions:

How will your home need to be modified to accommodate this technology?
Who else in your family could help with these ideas?
How will this technology place transportation demands on your family?
Can the device be easily moved or transported?
How much will this financially cost your family?
How much time will be required for the child and others to use the device?
How much training will be required to learn to use the device?
Can your home accommodate the size or space needed for this device?
Where will you store the technology?
How will this technology change how your family communicates with each other?

Dreams and desires for the future:

What would you like to accomplish in the next several months with technology?
How would you see this happening in your everyday lives?
Describe what you would like to see happen as a result of using this technology.
Describe what you dream the future will hold for your child.
How will you know when this assistive technology has been successful?
How will you know if it is time to change the technology?
Describe how the school or program can help you to meet your desires.
How long do you foresee it will be before your child outgrows this technology?
Will this technology support your child in building friendships for the future?
Will this technology help your child in the next environment?

TABLE 2

Family Problem-Solving Process for Use of Assistive Technology in the Home

1. **What is your desired outcome? (Address priorities and concerns)**
   What have you been told about (assistive technology, etc.)?
   If you could focus your energy on one thing, what would that be?
   Describe what you would like to see happen for your child after using this technology.
   What do you want to accomplish in the next 3 months that will help your child?

2. **What can your family and the program do? (Brainstorm alternatives)**
   How do you see this happening in your everyday life and home?
   What are some ways of getting to where you want to be?
   What would a trial use of this device be like for you and your child?

3. **Think it over and decide on action. (Examine family values, resources, and impact)**
   Who in your family could help with this device or learn to use this technology?
   How, if at all, will this device put demands on your family?
   How will this device get from home to school and back home again?
   How will your home need to be modified to accommodate this technology?
   What will it cost for you to modify or change your home?
   Describe for me the ideas with which you are most comfortable.

4. **Take action. (Tasks to do with strategies and activities)**
   What needs to be done to make this happen?
   What specific changes will you see for yourself and your child?
   Who needs to be involved in getting done what you want to do?

5. **Are we there? (Criteria and timelines for evaluation)**
   How will you know when this assistive device is successful?
   How long do you think it will take?
   How will you be able to tell if you (we) are successful at reaching this outcome?
   When will you know that the trial period is completed?
   When will you know if it is time to change?

own home. A home-centered approach to assistive technology examines the types of assistance that will enable a child to achieve greater development and functional capabilities in the home environment.

Assistive devices can also be intrusive or burdensome to families. A home-centered approach to the use of assistive technology assures that both the physical and social contexts of the child's life are considered in the development and prescription of the use of assistive technology. This approach gives families a key voice in making decisions about assistive technology that will fit their own family home and culture. This will ultimately be the most successful approach for the entire family.

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From: A Home Centered Approach to Assistive Technology Provisions for Young Children with Disabilities, M.J. Brotherson, C.C Cook, and H.P. Parette, Jr., 1996, *Focus on Autism and Other Developmental Disabilities*, 11(2), 86-95. Copyright (1996) by PRO-ED, Inc. Reprinted with permission.

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Young Children Using Assistive Robotics for Discovery and Control

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Can young children with severe disabilities learn to use a robot to accomplish tasks? Can they learn that they have some control over their environment? What are new developments in robotics that might benefit these very young children? This article provides the latest in robotics-exciting news for teachers, parents, and caregivers of young children with severe disabilities.

Considering the Developmental Needs of Young Children

The physical manipulation of objects is a major contributing factor in the development of cognitive and language skills in very young children. Children are active learners, and development is an interactive process between the child and the environment. Very young children face a critical task in learning to recognize the relationships between their actions and the effects of those actions on the environment (Hanson & Hanline, 1984). In developing these relationships, the young child learns to initiate and exert control over both social and nonsocial aspects of his or her environment. For a child with a severe developmental disability, this important learning of cause and effect and the development of a personal orientation as an active agent in the environment are far more challenging than for children without disabilities.

For these reasons, the direct manipulation of objects with an assistive robotic system that is controlled by a child is a promising area to explore with children with severe manipulation disabilities (Howell & Hay, 1989). The disabling conditions that are associated with poor control, or little or no use, of the upper extremities include cerebral palsy, arthrogryposis, spinal muscular atrophy, muscular dystrophies, rheumatoid arthritis, multiple sclerosis, poliomyelitis, spinal cord injury, head injury, and locked-in syndrome. The number of people with these conditions who also have severe manipulation disabilities in the United States is estimated to be at least 150,000 (Stanger & Cawley, 1996).

As a first step in the process of exploring the use of assistive robotics with young children with severe disabilities, Cook and his research team developed a robotic system that incorporated a commercially available robotic arm (Cook, Hoseit, Liu, Lee, & Zenteno, 1988; Cook, Liu, & Hoseit, 1990; Hoseit, Liu, & Cook, 1986). The primary questions addressed by the initial research were whether a very young child would interact with a robotic arm and whether that interaction would involve the purposeful use of the arm as a tool to accomplish some desired or requested action. This research differs from the increasing use of robotic systems to assist in tasks at work, in the home, or at school by older people with disabilities (see Foulds, 1986, for many examples). Service providers involved with these other applications have not typically considered either the developmental demands or the developmental benefits of robotic arm use by very young children.

Meeting Leah

The child that we spotlight is this article is Leah, a toddler with developmental delay and quadriplegic athetoid cerebral palsy. When the team began working with her, she had not begun to walk; and she had problems using her hands to grab and manipulate objects, although she was almost 2 years old. She also had difficulty speaking, but she was able to communicate some of her needs by vocalizing or gesturing

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Leah used the robotic arm purposefully as a tool to retrieve items.

toward a person or object that she wanted. Leah came to understand that when she hit a switch, the robotic arm moved (cause and effect) and that an object placed in a cup out of sight was still there (object permanence). She also understood that the robotic arm could bring things closer to her (tool use). These language and cognitive skills are typical of a 1-year-old child.

Despite her physical and cognitive difficulties, Leah was outgoing. She engaged communication partners in a variety of ways, including gesturing and taking toys to them to play. Despite the challenges presented by her disabilities, she loved to explore her environment. During one of our initial sessions with her, Leah and her parents played with a purse into which we had placed several different objects. She sat on the floor with her knees together and her feet spread out in back of her for support. As her mother handed her the purse, she struggled to turn it upside down to empty it, since she couldn't reach inside it. As each object fell out, Leah was delighted with her "discoveries"-such as the sound of keys and the shiny surface of a pocket mirror. She played with each object, grasping it loosely with the palm of her hand rather than her fingers, turning it around and over, handing it to her parents, and smiling and laughing to express her delight.

Enabling Leah

In our research, we explored an unusual way to enable Leah to increase her interaction with, and control over, her world. The team configured for her a small robotic arm and computer control system. We wanted to determine if a robotic arm would assist a toddler like Leah in reaching for and manipulating objects such as toys, developing some problem-solving skills, and increasing her use of language. In broader strokes, our overarching goal was for Leah to learn a general orientation of *personal agency* that teachers, therapists, and parents could build on (e.g., Ford & Thompson, 1985). In our conception, a sense of personal agency is manifested by direct and independent action toward items and people in the immediate environment, the function of which is to successfully control or influence these items and people to satisfy needs or desires.

Most children learn about objects by grasping and manipulating them with their fingers, mouthing them, and playing with them either alone or with others. In interactions with adults, children also learn the names of objects and how to talk about them while engaged in these manipulation tasks (e.g., put the block *in* the box," Meyers, 1994). This integral relationship between the physical manipulation of objects and the development of cognitive and language

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skills leads to the high likelihood that a child with severe motor development problems will have significantly impaired skills (Nof, Karlan, & Widmer, 1988).

Leah, like other children her age, needed to "learn by doing," and her interaction with objects in her environment was a critical part of this learning process. Because of her physical limitations, she had difficulty reaching objects, grasping them with her hands, manipulating them, and playing with them with other people. Through use of the robotic arm system, we hoped Leah would learn to overcome these limitations. If she used the robotic arm successfully, Leah could perform such activities as retrieving an object that was too far away from her to reach, picking up objects that were too small for her to grasp, or handing a toy to a friend. In addition, this "augmentative manipulation" (Heckathorne, 1986) might help her to learn such things as how to share toys, how an object looked from different perspectives (e.g., a shiny object catching the light when it is turned), and what prepositional words like *in, out, on,* and *under* meant. And finally, the team also hoped that Leah's use of the robotic arm would help her learn to actively initiate interaction with others, rather than be a passive observer.

The interaction with Leah took place at an early intervention program for children up to 36 months of age. Children in this program have disabilities that are associated with delays in their development of physical, cognitive, and language skills. Parents regularly participated in the program with their children. A team of professionals from many different disciplines helped assess the child's abilities and learn about her strengths and weaknesses. This team included infant/parent educators, occupational therapists, physical therapists, speech-language pathologists, and a clinical psychologist. The team provided the children with activities intended to promote their development, enhance strengths, and reduce weaknesses. The program also offered support activities to parents.

Meeting the Robot

The technology system that the team used with Leah consisted of a personal computer, software for robotic control and data collection, a small robotic arm, a single switch, and a joystick (Cook et al., 1988). The arm was about one-half the size of an adult human arm. It had an "elbow" and "shoulder" that rotated, and it could turn at its base. One could move the robotic arm to many different positions. At the end of the arm were two "fingers" that could be used to grip objects. The team "trained" the arm to complete a task through use of the joystick to move the arm through a desired movement (e.g., pick up a toy and hand it to Leah). During training, the movements were stored in the computer's memory so they could be repeated. This procedure made it easy for a teacher, therapist, or parent to train a specific movement that was of interest to Leah.

Four major phases characterized our program:

1. Our training of the robotic arm to perform specific actions.
2. Our teaching Leah how to control the robot.
3. Leah's initiations of the movements using a single switch.
4. Our monitoring of Leah's behavior prior to, during, and after robotic arm movement.

Training the Robot - and Leah

Our interaction with Leah began with an initial interview of the clinical program staff and her parents regarding objects that she preferred and the actions of the robotic arm that were most likely to be of interest to her. Her parents and the program staff suggested robotic arm movements based on tasks in which she typically attempted to engage. These included bringing a cracker to her when she activated the arm and dumping the contents of a cup to discover what was inside. Because many different movements were stored in the computer's memory, the team could easily change movements during a session to maintain Leah's interest.

The use of the robotic arm with Leah began with a period of familiarization during which we played with her and determined what her general reaction to the robotic arm was. During these sessions, she was curious about the arm and reached out to play with it. We then modeled for Leah the pressing of a switch to cause the robotic arm to move. We placed the switch in front of her and placed an object to be retrieved by the arm in her view but out of her reach. Leah appeared to be interested in seeing the robotic arm begin to move. After our repeated modeling, Leah eventually pressed the switch. She became excited and laughed when it moved. When it stopped, she vocalized and pointed to the arm in a movement that indicated she wanted the arm to repeat the movement. We recorded the number of times that she pressed the switch and the nature of her collateral behaviors (e.g., whether she looked at the switch, looked at the arm, or was restless).

To be able to draw inferences about Leah's understanding of cause-and-effect relationships, we systematically observed her behavior as she interacted with the arm. When Leah looked at the switch, then pressed the switch, and then turned to watch the arm move-all in immediate succession-we speculated that she knew that pressing the switch caused the arm to move. To interact successfully with a robotic arm, a user must not only learn the controlling inputs to which the robot responds, but also anticipate the movements that those inputs precipitate (Van der Loos & Leifer, 1996).

Near the end of our training sessions, Leah almost always looked at the switch before pressing it, then looked at the arm immediately after pressing the switch. We also observed the antecedents and consequences to determine any functional purpose to Leah's robotic arm activations. Leah showed us that she was attempting to retrieve an object using the robotic arm by pressing the switch to bring objects, such as a cracker, close to her. When the cracker was still out of reach, she pressed the switch again to bring it closer, then reached for it with her own hand. If it was still out of reach, she pressed the switch again. She repeated this sequence of actions until she could finally reach the cracker with her own hand. She also requested that new objects be placed in the cup so she could discover what they were by tipping the cup using the robotic arm. Leah showed heightened curiosity when the robotic arm began to bring the cup toward her, and she smiled and laughed when the cup was tipped and its contents fell on the table. She requested that this task be repeated by looking with an earnest expression at her mother, then at the cup, and squealing with delight.

Sequences such as these led us to conclude that Leah used the robotic arm purposefully as a tool to retrieve items such as a cracker or a cup containing a secret object (Cook et al., 1990). This tool use is unique to robotic arms when compared to the motorized toys or computer graphics typically employed as reinforcement for actions by students with severe disabilities, and it was highly motivating to Leah. The use of the robotic arm also showed her parents and the clinical program staff that Leah could solve problems, and it gave them a better understanding of her general capabilities.

Using the Robot as a Tool

In our research program, 50% of the children with disabilities and 100% of the nondisabled children actively interacted with the robotic arm and used it as a tool to obtain objects out of reach and manipulate them (Cook et al., 1988, 1990; Hoseit et al., 1986). All of the children with disabilities with a developmental age of at least 7 to 9 months interacted with the robotic arm, and those below this developmental level did not. All children older than 8 months interacted with the robotic arm as a tool. This study demonstrated that very young children can use a robotic arm to accomplish tasks that are of interest to them. The team also found that children were not fearful of the arm, and they were able to learn to use a switch to control it. Significantly, the children's gross motor and fine motor skill levels were less related to success in using the robotic arm than were their cognitive and language levels.

The research team currently is conducting further education-related research to determine the degree to which very young children will use assistive robotics for exploration and discovery and how this affects their cognitive and language skill development. Cook et al. (1988) developed for practitioners a hierarchy of assistive robotic movements, based on the complexity of the actions that a child needs to carry out, and therefore the degree of personal agency a child needs to manifest, to accomplish a specified task. In this hierarchy, a child progresses through the following levels:

- Simply playing back preprogrammed sequences of robotic actions, such as Leah performed.
- Selecting different switches to control different robotic movements (e.g., "reach," "grab," "rotate wrist") that can be used together to complete a more complicated task (e.g., reach for a cup, grasp it, and rotate it to dump its contents).
- Moving the robot to any location and then performing any robotic action by pressing switches corresponding to "up," "down," "left," "right," "open," "close." This latter level allows unlimited exploration and discovery by the child. For example, a child could use the arm in a sandbox to grab a shovel, fill a pail with sand, and dig in the sand to find hidden objects.

Using Robots: Guidelines for Assistive Robotics

From our own research program and an analysis of other clinical reports on assistive robotics (e.g., Heckathorne, 1986; Howell, Damarin, & Clarke, 1989; Howell & Hay, 1989; Nof et al., 1988; Topping, 1996; Van der Loos & Leifer, 1996; Verburg, Kwee, Wisaksana, Cheetham, & van Woerden, 1996), we offer the following recommendations to teachers and therapists who are interested in using assistive robotics for children and adults with severe manipulation disabilities:

1. Determine the range of the workspace in which the student might be required to (or desire to) perform manipulation activities, the manipulation characteristics of the educational activities to be accomplished within that space, and the dimensions of the three-dimensional space that the robot can address (termed the robot's "operational envelope").
2. Evaluate the degree of structure in the educational work environment; structured environments are composed of objects and materials in fixed locations, which the student will engage in manipulation activities that are predefined. The more structured the environment, the simpler the cognitive and physical demands placed on the student and the more efficient the student's performance in that environment. Structured environments, however, typically require prior set-up by teachers and parents and limit the student to only those activities that were previously prepared for. In completely unstructured school, work, and living environments, users of a robot must be able to perform the most sophisticated oversight functions by first deciding which task should be carried out and then explicitly guiding the robot's movements through all of the task requirements using their own judgment and sensory capacities.
3. Assess the student's abilities and control interface needs for adequate control of the robot. The alternate input devices that can be used with assistive robotics can be tailored to the student's type and degree of disability and the amount of precision required by the educational tasks (e.g., keyguard, multiple-switch array, touch screen, eyebrow switch, sip-and-puff switch, speech recognition).
4. Select a control interface that minimizes the cognitive load on the student. The control mechanism should be easy, obvious, and intuitive to the largest extent possible, while still providing sufficient precision in the robot's operation for the intended educational tasks. At first, permit the student to control the robot throughout its operational envelope with only a minimal number of switch closures. Computer displays, if used, should be uncomplicated.
5. Train to achieve *heightened automaticity* of the robot-controlling responses of the student. You want the student to remain focused on the educational content of the activity, rather than having to attend closely to operating the robot. The training method of "increasing assistance" (modeling, verbal, gestural, and physical prompts) has been successful in this instruction.
6. Consider the balance between the amount of student-directed and computer-controlled robotic movements and, as the student's motivation and understanding of cause and effect grows, adjust this balance to facilitate greater student independence. (You can preprogram sequences of robotic movements to be activated by a single switch closure for

ease of operation, but such programming results in limited versatility for the student. On the other hand, you can program the robot so that the student can activate each individual component movement by a separate switch closure and thereby combine the movements into an infinite number of sequences, but this "micro-management" results in more complicated and slower student-robot interaction. At the beginning of training, avoid giving the student control over too many robot options to prevent frustration with the number of choices to be made in accomplishing meaningful action by the robot.) Students with severe cognitive disabilities most likely will begin with single-switch activation of complete motion sequences before they can use multiple-choice switch arrays for different subsequences and then discrete activation of each individual movement.

7. Design a training protocol that is appropriate to the student's develop mental level, providing a structured learning environment and gradually increasing levels of performance (see box, "Training Sequence for Students ").
8. In all stages of training, structure the learning situation so that the robot performs a *useful*

Educational and Assistive Robotic Systems and Resources

Logo Robotics
Terrapin Software
10 Holworthy Street
Cambridge, MA 02138
Voice: 800-774-5646
Fax: 617-492-4610
E-mail: infoaterr@pinlogo.com
Web: http://www.terrapinlogo.com
Robotix
Learning Curve International
314 W Superior Street, 6th Floor
Chicago, IL 60610-3537
Voice: 800-704-8697
Fax: 312-654-8227
E-mail: education@Learningcurve.com
Web: http://www.learningtoys.com
Educational Electronic Robots
Elekit Company
1160 Mahalo Place
Compton, CA 90220-5443
Voice: 310-638-7970
Fax: 310-638-8347
E-mail: owi@ix.netcom.com
Web: http://www.owirobot.com/
menu.html
Lynxmotion Robots
Lynxmotion, Inc.
104 Partridge Road
Pekin, IL 61554-1403
Voice: 309-382-1816
Fax: 309-382-1254
E-mail: jfrye@lynxmotion.com
Web: http://www.lynxmotion.com
Robix RCS-6 Construction Set
Advanced Design, Inc.
6080 N. Oracle Road, Suite B
Ibcson, AZ 85704
Voice: 520-544-2390
Fax: 520-575-0703
E-mail: desk@robix.com
Web: http://www.robix.com/

The Robot Store
Mondo-tronics, Inc.
4286 Redwood Highway, #226
San Rafael, CA 94903
Voice: 800-374-5764
Fax: 415-491-4696
E-mail: info@mondo.com
Web: http://www.robotstore.com
The Manus Manipulator
Exact Dynamics b.v.
Einsteinstraat 6-c
NL-6902 PB Zevenaar
The Netherlands
Voice. 011-31-0316-334114
Fax: 011-31-0316-331327
E-mail: dynamics@worldonline..nl
Web: http://home.worldonline.nl/
~ dynamics
Handy I
Rehab Robotics Ltd.
Suite 33
Keele University Science Park
Keele, Staffordshire ST5 5BG
United Kingdom
Voice: 011-44-1782-712774
Fax: 011-44-1782-713230
Web: http://homepages. enterprise. net
/dallaway/rrjump/
Robot for Assisting the Integration of the Disabled
Oxford Intelligent Machines Ltd.
12 Kings Meadow
Ferry Hinksey Road
Oxford, OX2 ODP
United Kingdom
Voice: 011-44-0865-204881
Fax: 011-44-0865-204882
E-mail: sales @oxim.demon.co.uk
Web: http://www.oxim.demon.co.uk/

Rehabilitation Robotics Jumpstation
Webmaster: Dr. John L. Dallaway
Senior User Interface Software Eng.
Cygnus Solutions Ltd.
Sunnyvale, CA
Voice: 800-294-6871
E-mail: john.dallaway@bigfoot.com
Web: http://homepages.enterprise.net/
dallaway/rrjump/
Robotics Internet Resources Page
by The Laboratory for Perceptual Robotics
Department of Computer Science
University of Massachusetts
Amherst, MA 01003-4610
Webmaster: Chris Ian Connolly
E-mail: connolly@ai.sri.com.
Web: http://www-robotics.cs.umass.
edu/robotics.html
Robot Information Central
by Arrick Robotics
P.O. Box 1574
Hurst, TX 76053
Voice: 817-571-4528
Fax: 817-571-2317
E-mail: info@robotocs.com
Web: http://www.robotics.com robots.
html
Robotics Frequently Asked Questions
by The Robotics Institute
Carnegie Mellon University
5000 Forbes Avenue
Pittsburgh, PA 15213
Webmaster: Dr. Kevin Dowling
Voice: 978-670-4270
E-mail: nivek@cmu.edu
Web: http://www.frc.ri.cmu.edu/ ro
botics-faq/TOC.html

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task for the student. As a result, student interest in the activity and motivation to use the robot will be greater, and the student will be more likely to use the skill in other situations.

9. Consider the mode and the amount of complementary feedback to provide to the student about the robot's position and movements. Visual feedback is naturally available to students by the robot's actual movement, but this information is not always correctly interpreted by students. For example, when students look directly at the front of the robot, their visual perspective is the reverse of the orientation of the robot-so that telling the robot to "turn right" will make it turn *to the student's left.* Under such control situations, the student must be able to adopt the perspective of the robot when issuing movement commands.
10. Regularly evaluate student progress toward the educational objectives to determine whether the robot continues to assist in meeting the manipulation needs and to determine what modifications might be needed for the following: the student's training on the robotic system, the robot's operating characteristics, or the student's objectives. Teacher-friendly assistive robotics applications should provide automatic data recording of the frequency, type, and time of the student's activations of the robot and generate reports on the student's progress based on these data.
11. Be sure to incorporate physical restraints and software safeguards over the robot's movements to ensure the student's safety during any intention ally or unintentionally activated robot movements; do not allow the student to enter the robot's operational envelope; and conduct regular checks on these features.

Exploring Robotics

The use of assistive robotic systems with young children with disabilities is still in an exploratory stage. Many exciting and challenging issues remain to be investigated. The cost of robotic systems continues to decrease, and the availability of applications specifically for this population increases (see box, "Educational and Assistive Robotic Systems and Resources" for commercial robotics systems and the box "Annotated References" for descriptions of key assistive robotics articles).

The ability to control one's environment plays a large role in determining an individual's self-perception. If children learn they can affect their world, then they will acquire an enhanced

Training Sequence for Students

The following framework for a training sequence in robotics can lead to improved cognitive skills and a greater sense of personal agency for students with severe disabilities:

1. Arrange the learning situation so that the student can, with a simple switch closure, explore objects of interest through simple preprogrammed and consistent actions of the robot.
2. After the student achieves a criterion level of performance at this stage, arrange the situation so that the student can now manipulate the objects in ways that are specific to the properties of the object - in unique and functional ways.
3. Once the student learns at this stage, change the response requirements for robot operation so that the student has to stay engaged with the robot to achieve the end result. Program the robot to pause at various points in the movement until the student re-presses the switch.
4. After the student has become fluent at this stage, provide him or her the opportunity to sequence and coordinate the component parts of the robot's movement into more complex and novel chains. Experiment by changing the environmental demands and task requirements to encourage the student to become more facile with this sequencing and to generalize his or her augmentative manipulation skills.

self-image, they will learn to interact socially, and they will learn that they can have an impact on other people and objects that they encounter. They will be active agents in their world rather than passive observers of it. The skillful implementation of assistive robotic systems by teachers and other practitioners can contribute significantly to this improvement in awareness, functional skills, and orientation by children with severe developmental disabilities

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Teaching Exceptional Children, Vol. 31, No.5, pp 72-79.
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Infant-Toddler Intervention
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Use of Assistive Technology With Young Children With Severe and Profound Disabilities

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An alternating treatment design was used with two subjects in their preschool settings. During the four phases of the study, the subjects received treatment with the switch alone, switch-activated computer programs, switch-activated toys, and alternating sessions with the two devices. Thirty-two data points were achieved for Subject 1; 40 data points were achieved for Subject 2. All sessions were videotaped, and three behaviors were coded: independent switch activation, orientation to the stimulus, and attention to the stimulus. Both subjects demonstrated their highest performance with all three measured behaviors when both the computer programs and the toys were used. Results of the study indicate that young children with severe and profound disabilities perform best when provided with a variety of multimodal stimuli. They also appear to perform best when allowed sufficient time to interact on their own with minimal extrinsic feedback.

The use of assistive technology is an accepted means of intervention for young children with special needs (Brinker & Lewis, 1982; Clements, 1987). The Technology Related Assistance for Individuals with Disabilities Act of 1988 (PL 100-407) states assistive technology devices are defined as "any item, piece of equipment, or product system, whether acquired commercially, off the shelf, modified or customized, that is used to increase, maintain or improve function." In the last decade, new technology devices ranging from simple switch-activated toys to sophisticated augmentative communication devices and environmental control systems have been used with young children with disabilities. Since the appearance of the personal computer in the early eighties, special educators have advocated the use of microcomputers in the classroom with focus on the effects of the use of educational software on cognitive skill development. Speech and language pathologists have advocated the use of software to enhance development of language in children (Schery & O'Connor, 1992; Schery & Spaw, 1993). Recently, research has described the effects of assistive technology with young children with special needs from birth to three years of age. Public Law 102-119 mandates that assistive technology be provided for these children when appropriate. Minimal research is available, however, on the use of assistive technology with young children with severe and profound disabilities.

Children with these disabilities often have minimal opportunity to interact with their environment or to participate in normal sensory experiences. They often are unable to play with toys and to consistently express their needs to parents or caregivers. Intervention with assistive technology devices may offer children with severe and profound disabilities a means of interacting with their environment and simultaneously allow more efficient and effective caregiving by family members and professionals. For successful use of assistive technology, children must have an identifiable, reproducible motor pattern and sufficient sensory skills to recognize the stimulus being provided. The purpose of this study was to document the effects of simple switch-activated computer program use with two, 2- and 3-year-old children with severe and profound disabilities who had demonstrated inconsistent interaction with their environment.

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Review of Literature

Assistive Technology

Literature on the use of adapted computer systems with children with severe and profound disabilities is scarce. Schweigert and Rowland (1992) described the classroom protocol they used with children with severe orthopedic impairments to initiate simple communication. The subjects were aged 10 months to 10 years, and had severe physical, cognitive, and sensory impairments. The authors described a protocol in which the children were initially trained to gain another person's attention by producing an identified motor response which was used later for switch activation. Investigators used affective behaviors exhibited by the children, such as facial expressions and gross body movements, to indicate attention and interest by the children. This study suggests that children with severe and profound disabilities may have the potential to learn simple tasks which could greatly improve the quality of life for themselves and their families.

Results of Brinker and Lewis' research on contingency learning could be applied to the severe and profound population. Brinker and Lewis (1982) recommended the use of microcomputers for contingency learning with young infants with disabilities. They suggested that children who might benefit from use of microcomputers included those who show no interest in physical objects in their environment, those with no consistent reaching, no reported favorite objects by parents, and no attempt to visually regard objects or to hold them when placed in their hands. Brinker and Lewis suggest that activities with adapted computer systems provide the important non-social character of contingency learning which is not easily experienced by children with disabilities who rely on social interaction from adults for most learning.

Contingency Learning

Contingency learning refers to an individual's understanding that certain behaviors produce certain rewards or external stimuli. In studies using a contingency paradigm with normally developing infants, one group of infants received stimulation (e.g., a picture with music) contingent on a motor response, while another group received matched amounts of noncontingent stimulation. Infants receiving contingent stimulation demonstrated more frequent occurrence of the motor response, greater visual fixation on the stimulus, less fussiness, and increased smiling, and alertness than the infants receiving matched noncontingent stimulation (Lewis, Sullivan, & Brooks-Gunn, 1985; Sullivan & Lewis, 1989).

The importance of providing contingency experiences for infants with disabilities has been suggested by several authors (Brinker et al., 1982; Brinker & Lewis, 1982a). Because infants with disabilities are less likely to experience contingent learning due to physical limitations, further impairments may result if contingency experiences are not provided. Brinker et al. (1982) used a curriculum of contingency experiences with children 6-50 months chronological age but 2-5 months mental age. The children learned two motor patterns consisting of arm or leg movements which produced an auditory, visual, or tactile stimuli. All children with multiple disabilities demonstrated clear differentiation between a reinforced and a nonreinforced motor response. These children required up to 13 intervention sessions before differentiation was demonstrated; children in the study with less severe involvement demonstrated differentiation immediately. The study suggests that children with severe cognitive disabilities may have the potential for learning using contingency responses if they are given additional time for learning to occur.

Dunst, Cushing, and Vance (1985) studied contingency learning with six infants with severe and profound disabilities. The infants were presented with multicolored lights above their crib contingent on turning their heads toward midline. The authors present some evidence of contingency learning in infants with severe and profound disabilities and suggest that sufficient time and initial physical prompting may assist the infants.

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The literature suggests that children with severe and profound disabilities may have the ability to learn with the use of contingency responses, although they may require more time and physical prompting. Switch-activated toys and computer programs can provide contingency experiences and offer multimodal stimulation for children with central nervous system impairment. Because of the potential impact on the learning process of these children and on enhanced caregiving, a study was designed to systematically investigate the use of assistive technology with this population.

Method

Subjects

The study was approved by the University of North Carolina's School of Medicine Committee for Human Subjects and by the board of directors for participating early intervention centers. Informed consent was obtained from each subject's parents prior to inclusion in the study.

Subjects were two children, aged 40 and 24 months and attending center-based early intervention programs 5 days per week. Subject 1 was male, African American, and had a diagnosis of hydranencephaly, profound mental retardation, and unqualified visual loss. Subject 1 demonstrated no head or trunk control and was dependent for all mobility and self-care activities. Active movement was limited to small arc shoulder movements and cervical rotation with no active reaching. He visually fixated on a light and a black and white toy but did not demonstrate tracking. He consistently localized to animate and inanimate auditory stimuli.

Subject 2 was female, Caucasian, and had a diagnosis of multicystic encephalomalacia, spastic quadriplegic cerebral palsy with moderate mental retardation. She had poor head and trunk control and her predominant movement pattern was total extension with cervical rotation to the left. She demonstrated inconsistent swiping with her left arm. She visually fixated on a light and a brightly colored toy, and demonstrated limited tracking. She kept her eyes closed throughout most of the evaluation as she did during observed classroom activities. She consistently localized to animate and inanimate auditory stimuli.

Equipment and Assessments

The "Big Red" switch (Ablenet, 1992) was used with the Universal Timer (Toys for Special Children, 1993) to control the duration of feedback provided by the computer programs and the toys for each switch contact. The Apple IIGS computer with Adaptive Firmware Card (AFC) was used with the public domain software program "Switches, Pictures, and Music" (Schmidt & Schmidt, 1988). The program consists of a choice of brightly colored pictures which flash, giving the illusion of movement, and a choice of songs. Two songs and two pictures, both consisting of faces were chosen for the study. Two switch-activated toys were used which provided both three-dimensional, visual feedback (squeaking or drumming) when switch contact was made. A drumming bear and a hopping rabbit which squeaked were chosen. Data analysis was performed with the Observational Coding System (Triangle Research Systems, 1993). The system allowed input of data from coding of the videotapes directly to a computer. The overlay system permitted editing of codes in synchrony with the videotapes. Summary statistics were obtained for individuals sessions and variables.

The TADPOLE Evaluation (Rehab Therapy Inc., 1992) for assistive technology devices was used for initial evaluation of each subject. The evaluation was developed to determine children's initial level of function and to track progress in using assistive technology devices. Results of the evaluation were used to determine optimal seating position for the child, switch placement, placement of the toy or computer monitor, and the motor behavior to be used for switch activation.

Procedure

Research Design

The study was designed using an alternating treatment design with baseline measurement as depicted in Figure 1 (Barlow & Hayes, 1979; Kazdin, 1982; Ottenbacher, 1986). The design is useful for comparing the effects of two or more treatments or of treatment to no treatment. Phase 1 consisted of two, 15-minute sessions per day for 2 consecutive days of baseline intervention using the "Big Red" switch. The baseline was included to determine each subject's initial level of function when interacting with the switch alone. Phase 2 consisted of two, 15-minute sessions per day for 2 consecutive days of intervention using either Treatment B (switch-activated computer programs) or Treatment C (switch-activated toys). Phase 3 consisted of two, 15-minute sessions per day for 9 consecutive days for Subject 1 and 10 consecutive days for Subject 2. Intervention consisted of alternating sessions of the two treatments. On the first day of Phase 3 for each subject, treatments were randomly chosen for the first session. Both treatments were used each day, with the treatment occurring in the first session of the day being alternated for counterbalancing.

Videotapes of the initial 9 or 10 days of alternating treatment in Phase 3 were analyzed to determine the more effective treatment for each subject for frequency of attention. Phase 4 consisted of two, 15-minute sessions for 3 consecutive days of intervention for Subject 1 and for 5 consecutive days for Subject 2. Intervention consisted of only the more effective Phase 3 treatment.

Intervention Session Protocol

The principal investigator was the facilitator for all intervention sessions. All subjects were held in a sitting position on the floor, and the switch was attached to a bench placed in front of the child. The switch-activated toy or computer monitor was placed on a surface directly in front of the bench. The principal investigator provided verbal cueing to "hit the switch" intermittently throughout the session. Repositioning of the child was provided by the investigator when she determined that the child could no longer interact with the switch or stimulus due to poor positioning. Videotaped

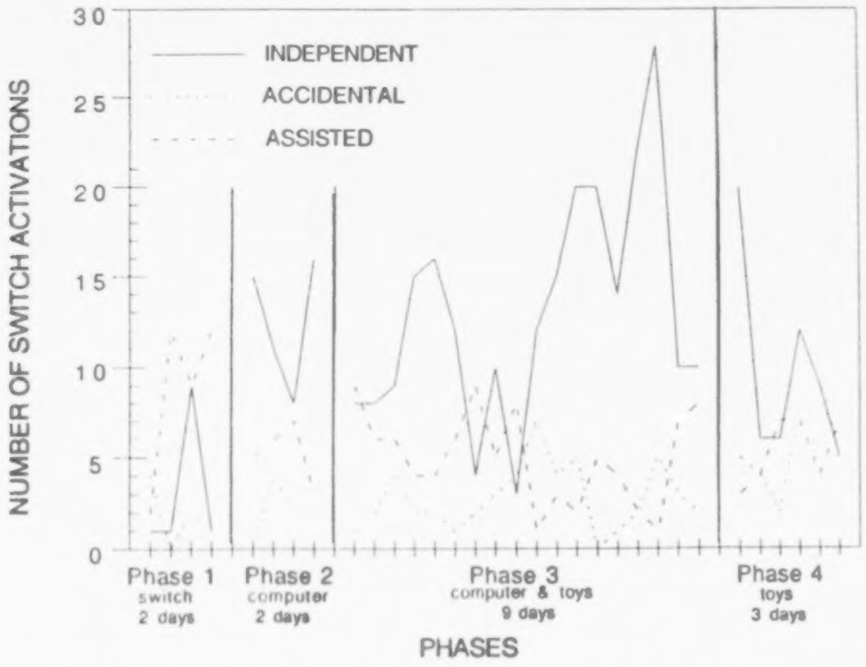

Figure 1. Subject 1: Frequency of independent, accidental, and assisted switch activations according to session.

sessions of each subject were randomly chosen by the second author and were evaluated for consistency and type of verbal feedback, physical handling, and positioning by the principal investigator. Feedback was periodically given throughout data collection in order to maintain consistency of the principal investigator's involvement during the sessions.

There were two intervention sessions of fifteen minutes duration each on every day with a 60- to 90-minute interval between each session. At the beginning of each session, the action required for switch activation was demonstrated to the child by the principal investigator, three times. The child was then assisted by the principal investigator in performing the required action three times. During a 15-minute session, if the child did not interact with the switch within a 1-minute period, the child was assisted by the principal investigator in performing the action. Each switch activation resulted in 8 seconds of the stimulus.

Data Collection

All sessions for each subject were videotaped. At the end of each session, the principal investigator documented descriptive aspects of the subject's performance. Prior to beginning the study, subjects' parents and teachers were interviewed to determine how they felt the children responded to stimuli in the environment. This information was used in measuring orientation and attention to the stimulus during intervention sessions. A daily questionnaire was developed for the study and was completed by the teacher. The questionnaire was used to determine if the child was having a typical day. The information was used at the end of the study to compare with performance in intervention sessions for each child.

Data Analysis

Three dependent variables were measured from the tapes. Frequency of switch activation was the number of independent switch contacts by the child in one 15-minute session resulting in activation of the toy or computer program. Activations during the time the program or toy were running were not counted. Frequency of orientation to the stimulus was the number of occurrences of changes in body or head posture, changes in extremity movement, or changes in facial movement present in conjunction with activation of the stimulus during one 15-minute session. Occurrences of any one or more of these behaviors during the time the stimulus was present were credited as one occurrence of orientation. Credit for orientation was given when it was the only behavior observed with no attention behaviors demonstrated. Frequency of attention to the stimulus was the number of occurrences of visual fixation or visual scanning of the stimulus, smiles, vocalizations, or quieting present in conjunction with activation of the stimulus during one 15-minute session. Occurrence of any one or more of these behaviors during the time the stimulus was present was credited as one occurrence of attention. If the child demonstrated both orientation and attention during one stimulus, credit was given for attention unless orientation was the predominant behavior (occurring for the majority of the 8-second duration of the stimulus).

The videotaped sessions were analyzed by the principal investigator using the Observational Coding System (Triangle Research Systems, 1993). The tapes for each subject were coded after all phases of the study for the subject had been completed. The original videotapes were copied by the second author in random order, with all identifying information deleted. Each switch activation was coded according to the type of hit: independent hit by the subject, assisted hit, and accidental hit during positioning. All orientation behaviors were scored as a single code. Attention behaviors were scored as one of five codes: fixation, scanning, vocalization, smiling, or quieting. Each 8-second stimulus of the toy or the computer program received a code for type of switch activation and a code for predominant behavior. If the subject did not respond to the stimulus, a score of no response was given. Behaviors occurring between stimuli were not coded but were documented for descriptive information.

After all sessions had been coded, summary statistics for each session were calculated using the Observational Coding System. This provided frequency counts of all behaviors coded during a single session. Frequency counts of specific behaviors occurring with each of the three types of switch activations were calculated.

Visual analysis of the data was performed for each of the three measured behaviors for each subject using graphs. The graphs were analyzed for variability, changes in level, and changes in trend during each phase. Trend estimation was calculated using the split-middle method (Wolery & Harris. 1982).

Reliability

Interrater reliability was tested with the principal investigator and the second author who was familiar with the use of assistive technology with children with severe and profound disabilities. The videotapes of each subject were used during training sessions so both raters could become familiar with their individual behaviors. Reliability was tested with a random selection of at least one session of each phase of the study per subject. Kappa values were calculated for each phase. Kappa values for Subject 1 were 0.56, 0.68, 0.70, and 0.75. Kappa values for Subject 2 were 0.59, 0.67, 0.79, and 0.83. Most errors occurred in scoring a behavioral response as orientation or quieting. There was no trend of one rater consistently scoring individual behaviors more frequently than the other rater.

Intrarater reliability was tested by the principal investigator on 10% of the sessions. Kappa values for behavioral response for Subject 1 were 0.74, 0.81, and 0.89. Kappa values for behavioral response for Subject 2 were 0.83, 0.84, 0.85, and 1.0. Most disagreements were made when scoring no response, orientation, or quieting.

Videotapes of sessions for each subject were randomly selected and evaluated by the second author for the principle investigator's consistency in administering the intervention. Frequency and type of verbal feedback, physical handling, and positioning were determined to be consistent and appropriate throughout all phases of the study. Variable behavior and state control was exhibited by the subjects and differences in frequency of feedback were judged to be appropriate techniques for assisting the child in maintaining behavioral control.

Results

Subject 1

Frequency of Switch Activation

Figure 1 represents the frequency of the three different types of switch activation for Subject 1 for all sessions over the four phases of the study. The trend lines are included for each phase of the study. With the exception of Phase 1, the baseline phase, frequency of independent switch activation was greater than frequency of assisted or accidental activations.

Figure 2 compares the frequency of independent switch activation by Subject 1 for the computer programs and the switch-activated toys. Level of switch activation for Subject 1 during Phase 2 increased when compared to Phase 1. During Phase 3, frequency was greater for the switch toys. During Phase 4, only the switch-activated toys were used, and the level of switch activation decreased.

Frequency of Orientation

Figure 3 compares the frequency of orientation by Subject 1 with the switch-activated computer programs and the switch activated toys. During Phase 1, there was an increase in level and trend in orientation, which continued during Phase 2. During Phase 3, there was a decrease in trend in orientation with both the computer programs and the toys, but frequency of orientation with the toys was greater than with the computer programs. Trend line estimation revealed a slight increase in orientation during Phase 4.

Frequency of Attention

Figure 4 compares the frequency of attention by Subject 1 with the switch-activated computer

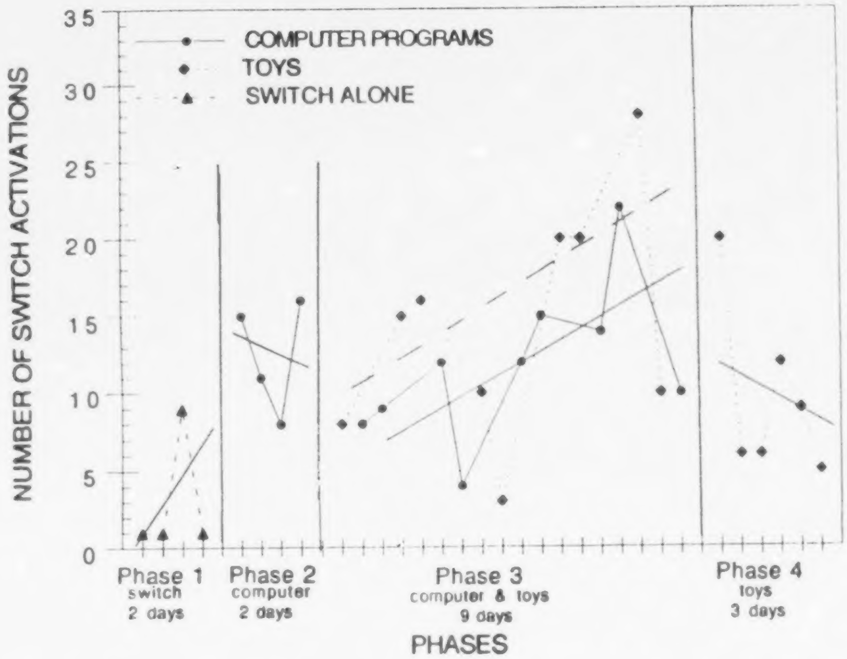

Figure 2. Subject 1: Frequency of independent switch activations according to use of computer programs or toys.

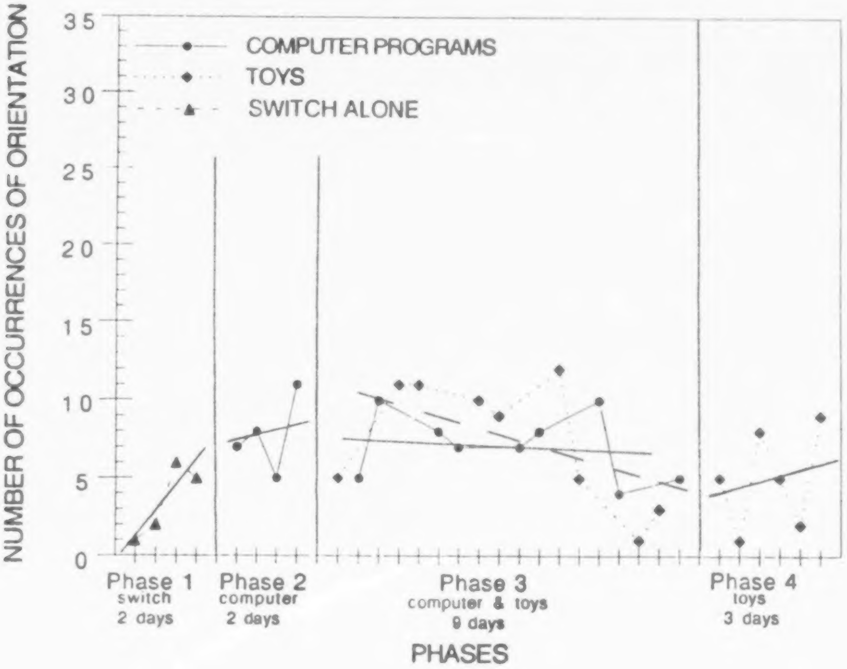

Figure 3. Subject 1: Frequency of orientation to use of computer programs or toys.

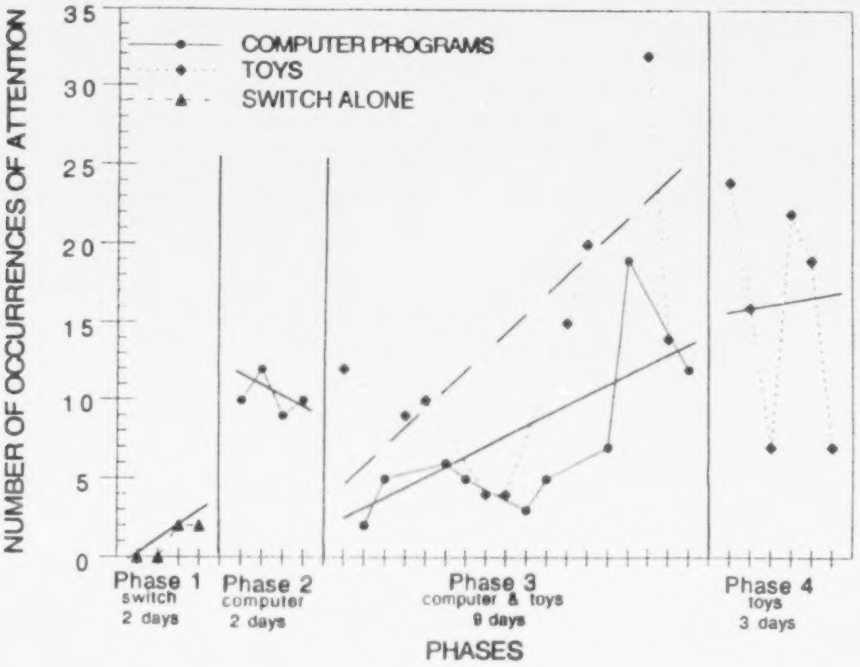

Figure 4. Subject 1: Frequency of attention according to use of computer programs or toys.

programs and the switch-activated toys. During Phases 1 and 2, there was an increase in attention to the stimulus. During Phase 3, there was an increased frequency of attention with both the computer programs and the toys, but the frequency of attention with the toys was greater. There was no change in trend for frequency of attention during Phase 4.

The predominant attention behaviors demonstrated by Subject 1 were visual fixation and scanning and quieting. Subject 1 demonstrated greater frequency of quieting when using the toys than when using the computer programs. He demonstrated greater frequency of fixation and scanning when using the toys, but there was little difference in the values.

The percent of occurrences of orientation and the percent of occurrences of attention for all phases was calculated for independent switch activations and for assisted switch activations (see Table 1). Subject 1 demonstrated more frequent attention to the stimulus when he independently activated the switch than when he was assisted in activating the switch. There was minimal difference in frequency of orientation to the stimulus when he independently activated the switch and when he was assisted in activating the switch.

Analysis of data from Subject 1's videotapes revealed that independent switch activation often occurred in clusters. Clusters were defined as at least three consecutive independent switch activations. Sessions in which Subject 1 demonstrated clusters tended to be sessions with higher frequency attention. Most sessions with low frequency of independent switch activations and attention behavior coincided with teacher, parent, and principal investigator reports of fatigue or fussiness by Subject 1.

Table 1. Mean Percent of Orientation and Attention and Standard Deviations During All Phases of the Study for Independent Switch Activations and Assisted Switch Activations for Subject 1.

	Independent Switch Activations	Assisted Switch Activations
	MEAN (SD)	MEAN (SD)
Mean Frequency Orientation	31.2 (26.5)	34.6 (28.2)
Mean Frequency Attention	58.7 (30.9)	40.7 (34.7)

Subject 2

Frequency of Switch Activation

Figure 5 demonstrates frequency of the three types of switch activation across the four phases of the study for Subject 2. With the exception of baseline Phase 1, frequency of independent switch activation was greater in each phase than was assisted or accidental switch activation.

Figure 6 compares the frequency of independent switch activation by Subject 2 for the computer programs and the toys. During Phase 2 when only the toys were used, there was an increased trend in independent switch activation over baseline. Trend line estimation revealed a slight decrease in frequency of independent switch activation with the computer programs during Phase 3 and a slight increase with the toys. Overall during Phase 3, frequency of independent switch activation was greater with the computer programs than with the toys. During Phase 4 when only the computer programs were used, there was a decreased level and trend in independent switch activation.

Frequency of Orientation

Figure 7 compares the frequency of orientation by Subject 2 with the switch-activated computer programs and the switch-activated toys. During Phase 1, there was a decrease in trend toward orientation with the switch used alone. In Phase 2 with the toys, there was an initial increase in orientation followed by a decrease, with an overall trend line toward decreased frequency of orientation. The level of frequency of orientation in Phase 3 is unchanged from Phase 2. The trend line for the computer programs and the toys during Phase 3 is flattened with minimal change in trend. The frequency count revealed slightly greater occurrence of orientation to the computer programs during Phase 3 than to the toys. In Phase 4 when the computer programs were used, there was an initial increase in frequency of orientation, followed by variability during the last half of the phase. Trend line estimation revealed an overall decrease in orientation during this phase.

Frequency of Attention

Figure 8 compares the frequency of attention by Subject 2 with the switch-activated computer programs and the switch-activated toys. There was a slight increased trend in attention during Phase 1 and a greater increase during Phase 2. During Phase 3, the level of frequency of attention increased with greater frequency with the computer programs than with the toys. The trend line estimation revealed slightly decreased frequency of attention with the computer programs and slightly increased frequency with the toys during Phase 3. In Phase 4, there is a trend of decreased frequency of attention with the computer programs.

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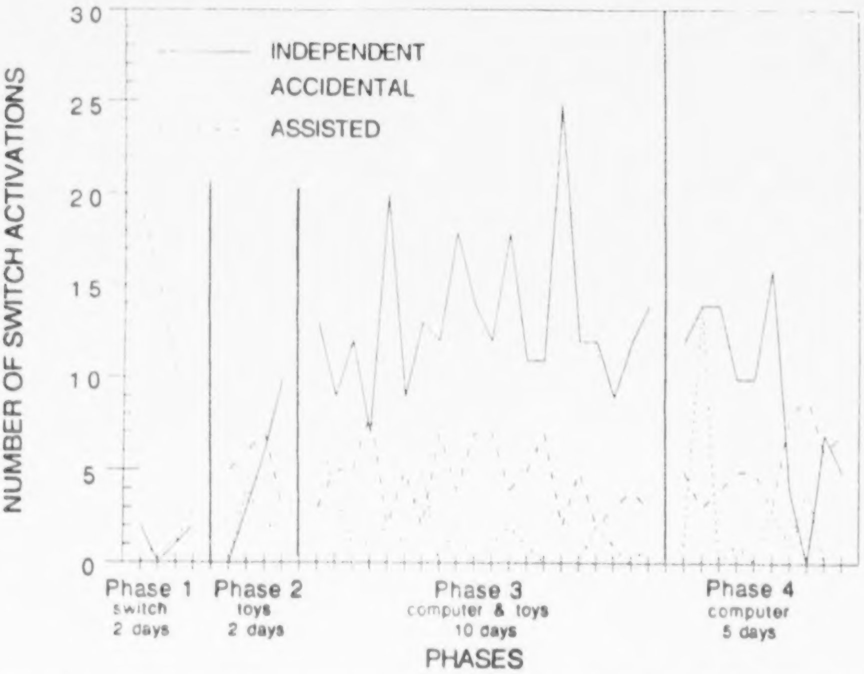

Figure 5. Subject 2: Frequency of independent, accidental, and assisted switch activations according to session.

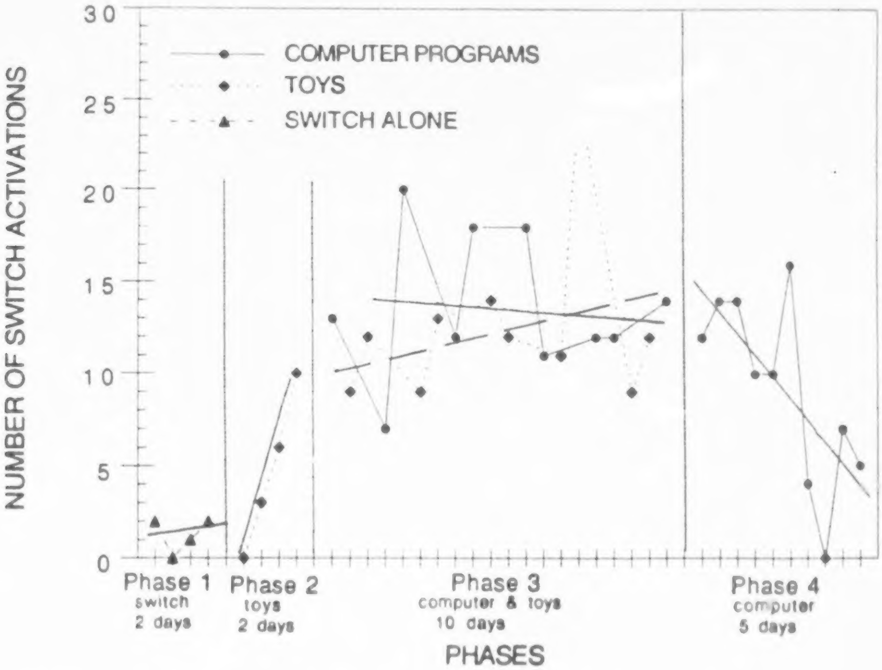

Figure 6. Subject 2: Frequency of independent switch activations according to use of computer programs or toys.

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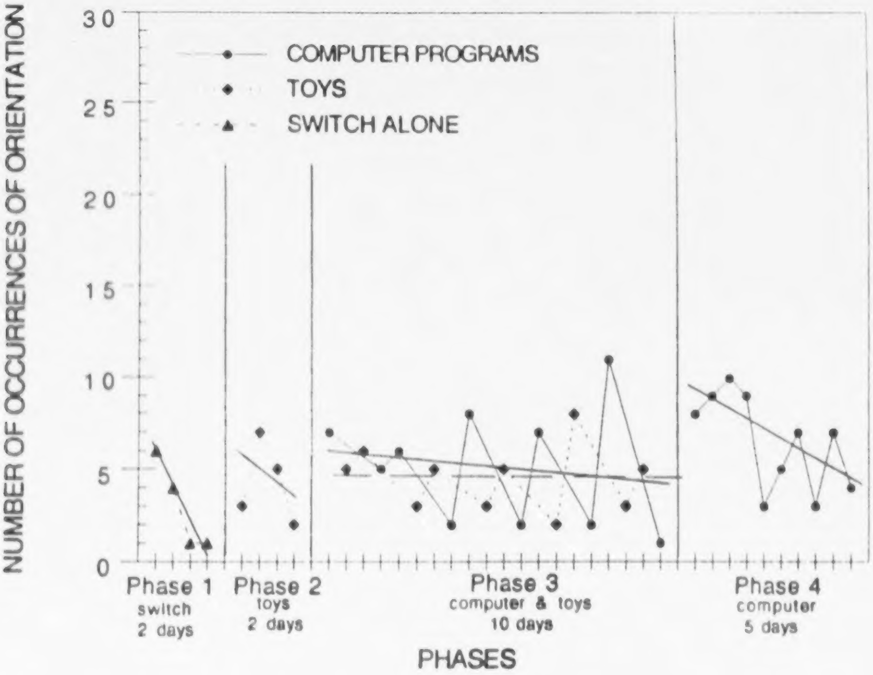

Figure 7. Subject 2: Frequency of orientation to use of computer programs or toys.

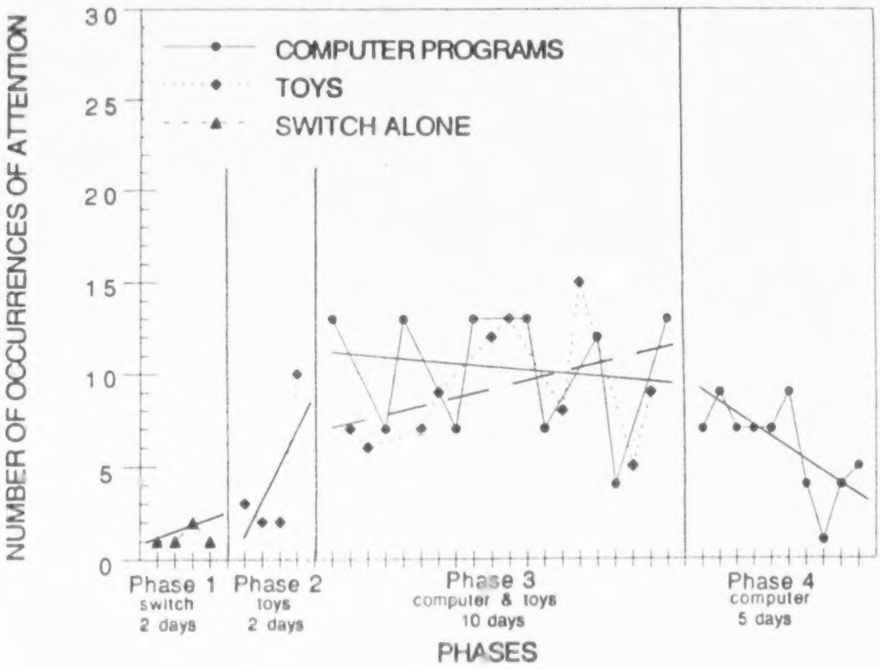

Figure 8. Subject 2: Frequency of attention according to use of computer programs or toys.

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Visual fixation and scanning and quieting were the predominant attention behaviors demonstrated by Subject 2. Subject 2 demonstrated near equal frequency of quieting with the computer programs and with the toys, and slightly greater frequency of fixation and scanning with the computer programs than with the toys.

The percent of occurrences of orientation and the percent of occurrences of attention and standard deviations were calculated for independent switch activations and for assisted switch activations (see Table 2). Subject 2 demonstrated greater frequency of orientation and of attention to the stimulus when she independently activated the switch than when she was assisted in activating the switch. High standard deviations indicate the variability of responses demonstrated by Subject 2.

Subject 2 also demonstrated clusters of independent switch activation as described for Subject 1. The clusters of independent switch activations occur in sessions in which frequency of attention was moderate or high. Sessions with no clusters were sessions in which there was lower frequency of measured behaviors.

Daily Questionnaires for classroom staff and descriptive narrative by the investigator for each session with Subject 2 were compared with graphs. Subject 2 was typically fussy in class, and only unusually fussy days were documented by the teacher as exceptional. Days in which Subject 2 was described by her teacher, parent, or principal investigator as fussy or drowsy were days with lower scores of independent switch activation and attention.

Subject 2 frequently became so fussy that the activities had to be stopped so that she could be calmed. When "time outs" were taken for calming, the approximate time was added to the end of the session. Seven of the first 17 sessions of the study had to be stopped due to fussiness. Only one session in the final 23 sessions was stopped due to fussing.

Discussion

The alternating treatment design used in this study allowed comparison of each subject's responses with switch-activated computer programs and switch-activated toys. As suggested by Ottenbacher (1986), the baseline phase allowed the conclusion that the subjects were not responding to the switch itself during Phases 2, 3, and 4. Their increased levels of response can be attributed to the computer programs and toys being used. Phase 2 was included, as suggested by Sidman (1960), to determine if there was a difference in response to one treatment presented alone and the two treatments presented in an alternating fashion. The more effective treatment in Phase 3 was

Table 2. Mean Percent of Orientation and Attention and Standard Deviations During All Phases of the Study for Independent Switch Activations and Assisted Switch Activations for Subject 2.

	Independent Switch Activations MEAN (SD)	Assisted Switch Activations MEAN (SD)
Mean Frequency Orientation	33.6 (25.7)	21.5 (22.0)
Mean Frequency Attention	46.2 (22.4)	36.3 (29.7)

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determined and presented alone in Phase 4 to determine if improvement continued.

This study, as do previous studies (Brinker et al., 1982a; Dunst et al., 1985), suggests that children with severe and profound disabilities can learn from contingency experiences. Both subjects demonstrated increased frequency of independent switch activation and attention over the first three phases of the study. Frequency of orientation also increased but at a less pronounced level. Because of the scoring system, the subjects were given credit for orientation only when they did not demonstrate an attention behavior. The increased frequency of attention demonstrated by both subjects resulted in decreased scoring of orientation behaviors.

In the session protocol, each subject received initial assistance in activating the switch, and assistance following each minute with no independent interaction. Dunst et al. (1985), suggested that initial physical assistance may result in improved performance of a contingency task. Giving the subjects initial and intermittent assistance may have resulted in increased responses. During the session, the children were given 1 minute before physical assistance was provided. Allowing sufficient time for the subjects to interact with the switch appeared to be important in facilitating independent switch activation.

Both subjects demonstrated evidence of motor learning in the study. Motor learning requires the learner to "organize a coherent pattern of movement that suits the demands of the task" (Higgins, 1991). Motor learning occurs when an individual practices a set of processes and produces improved performances over time (Schmidt, 1991). Both subjects demonstrated improved performance in switch activation during the 5-week course of the study. Weekend intervals occurred between Phase 2 and Phase 3, at the midpoint of Phase 3 and between Phase 3 and Phase 4. The subjects' performance on each of the variables was maintained over the weekend periods and continued to show improvement. Motor learning research (Schmidt, 1991: Winstein, 1991) suggests that when a skill has been learned, the performance will be maintained even with an interval of no practice. If improved performance is due only to practice, the performance will decline following an interval of no practice. The maintained performance by the two subjects following the weekend intervals suggests that they had learned the skill instead of demonstrating improvement only during practice.

Although the overall trend was toward increased frequency of the behaviors, variability was present throughout the phases for both children. Variability may be characteristic of children with severe and profound disability. In addition, an adequate baseline for each phase may not have been achieved prior to instigating the next intervention phase.

Throughout the study, both intersubject and intrasubject variability were present. The subjects' individual responses to the stimuli were different as was the type of assistance they required. Although both subjects demonstrated their best performance while receiving both toys and computer programs, Subject 1 demonstrated better performance with the toys; Subject 2 demonstrated better performance with the computer programs. In preliminary testing, Subject 2 demonstrated better visual tracking skills than Subject 1 whose auditory attention was reported as a strength by his teacher and mother. The brightness of the computer screen may have provided a stronger visual stimulus than did the toys for Subject 2. The varying auditory sounds of the toys may have been more interesting for Subject 1 than the computer tones.

Each subject gave behavioral cues indicating their state and needs. Individual cues were different between the two subjects but were consistently used by each child throughout the study. The importance of identifying and monitoring each child's behavioral cues was important in recognizing their response to the stimuli. Barnard (1978) has suggested a model of infant-caregiver interaction which is dependent on the clarity of an infant's cues as well as recognition of the cues by the caregiver. These subjects with very limited means of communication consistently used individual, behavioral cues to communicate their needs to the investigator. Children with severe and profound disabilities are often thought to respond minimally during treatment. Professionals working with these children should closely monitor cues they may be giving.

The highest performance level by both subjects during Phase 3 suggests that providing a variety of stimuli which challenges several sensory channels may produce the best response in children with severe and profound disabilities. In each case, the subjects performed better with the newer stimulus in Phase 3 but continued to demonstrate improvement with the familiar stimulus from Phase 2 as well. This suggests that the change in performance was not due to novelty. If the subjects were demonstrating preference for a novel item, their performance with the familiar item as well as the novel item should have deteriorated over the 2-week period of Phase 3 (Bornstein & Lamb, 1988). Their decreased performance during Phase 4 when only one type of stimulus was used again suggests that the variety provided in the alternating treatment phase was critical. Sullivan and Brinker (1993) suggest that variety is the key to continued performance in the use of switch technology with children with disabilities. They state that the more frequent the repetition of a single toy, the more quickly boredom will occur. These observers conclude that interest in a contingency activity declines after 4 to 6 minutes with normally developing infants and that infants with disabilities demonstrate similar responses. It is not clear from this study if the variety offered by the two types of devices or the different sensory input is more important for the observed performance. It does suggest that use of both switch activated computer programs and switch-activated toys is warranted with children with severe and profound disabilities.

Both subjects demonstrated greater frequency of attention to the stimulus following independent switch activations than following assisted switch activations suggesting that performing a response independently may be important for successful intervention with children with severe and profound disabilities. Several areas of research suggest that the child may have the best opportunity for learning during these periods of independent interaction with the stimulus. (Bebko, Burke, Craven, & Sarlo, 1992) suggests sensorimotor interaction as fundamental for learning to occur. The switch activities required a motor behavior that resulted in a sensorimotor experience which is rarely experienced by children with severe and profound disabilities.

Research on contingency learning with nondisabled infants (Brinker et al. 1982a; Lewis et al., 1985; Sullivan et al., 1989) and with children with disabilities (Brinker et al., 1982; Dunst et al., 1985) suggests the importance of the child independently eliciting the stimulus for improved response. Children receiving contingency responses demonstrated greater attention to the stimulus than children receiving matched, noncontingency stimulation. This result is supported in this study by the greater occurrence of attention to the stimulus with independent switch activations than with assisted switch activations. Limiting assistance and allowing the children sufficient time to respond independently before intervening is indicated.

During clusters of independent switch activity, minimal to no verbal feedback or physical prompting was provided by the investigator. This required that the subjects monitor their own responses and feedback. Motor learning research (Schmidt, 1991; Winstein, 1991) suggests the importance of intrinsic feedback with less reliance on extrinsic feedback from therapists or teachers as necessary in order to independently perform new motor tasks. An attempt was made throughout the study to provide minimal verbal cueing to the subjects, and assisted switch activation was provided only when they had not interacted with the switch for one minute. This allowed the subjects more time to respond on their own without the disruption of feedback from the investigator and to use their own intrinsic feedback to continue the activity. The occurrence of clusters suggests that limited feedback from the therapist may assist children with severe impairments in improving their performance.

Conclusion

This study compared the effects of switch-activated computer programs and switch-activated toys with two children, 2 and 3 years of age, with severe and profound disabilities. An alternating treatment design was used. Measured behaviors were frequency of independent switch activation, frequency of orientation to the stimulus, and frequency of attention to the stimulus. Subject 1 demonstrated greater frequency of the measured behaviors with the switch-activated toys. Subject 2 demonstrated greater frequency of the measured behaviors with the computer programs but with less difference than that exhibited by Subject 1. Both subjects demonstrated their highest level of performance during the alternating phase when the computer programs and the toys were used. Both subjects also demonstrated greater frequency of attention to the stimulus following independent switch activations than following assisted switch activations. The study suggests that providing a variety of stimuli and allowing the child to perform the response independently with limited extrinsic feedback is important for providing contingency learning experiences for young children with severe and profound disabilities. Future studies need to address the importance of positional adjustments, session duration, and recognition of individual behavioral cues in use of switch devices with children with severe and profound disabilities.

Although the subject pool was limited, and within subject and between subject variability existed, the results suggest an interesting learning potential exists in children with severe and profound disabilities. Future research is needed to address the issue.

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Supported in part by the Reseach and Training Branch of the Bureau of Maternal and Child Health, Grant 149, Department of Health and Human Services.

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Daniels LE, Sparling JW, Reilly M, Humphry R, Use of Assistive Technology With Young Children With Severe and Profound Disabilities, *Infant-Toddler Intervention*, 5(1) 91-112, 1995.

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8(2) 185-206

Family-Centered Assistive Technology Decision Making

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Use of assistive technology by young children with disabilities is expected to increase markedly in the next 10 years. However, for assistive technology to be utilized effectively, families must be involved in the decision-making and implementation processes. This article discusses a family-centered assessment and intervention approach that empowers and enables families in the selection and use of assistive technology. Included in the discussion are key characteristics of parent/professional partnerships: child, family, technology and service system domains; and the use of culturally sensitive practices that should be considered when making decisions about assistive technology devices and services.

In the last decade, new assistive technology devices have enabled young children with disabilities to play, learn, communicate, and interact with their environment to a greater degree than ever before. Examples of new assistive technology range from simple devices such as picture communication boards, switch-operated toys, and adapted spoons to more complex devices such as computers, powered mobility equipment, and augmentative and alternative communication (AAC) devices (Church & Glennen, 1992b). Although there has not been a substantial amount of research conducted regarding the efficacy of technology intervention with young children (Behrmann, Jones, & Wilds, 1989; Kinsley & Langone, 1995). Some studies have suggested that intervention with assistive devices offer children with disabilities a means of interaction with their environment. Use of assistive technology increases a child's opportunity to participate more fully in play, language, and socialization activities. Aided by the tools of assistive technology and services, families can help their young children with disabilities facilitate greater independence and integration into community settings. Computer applications, voice-output devices, and other high-tech devices so that he or she can function in the same settings and similar activities engaged in by typical young children. (Huntinger, 1996).

The impetus for the use of assistive technology evolves from the passage of Public Law (P.L.) 100-407 the Technology-Related Assistance for Individuals with Disabilities Act (Tech Act, 1988). This legislation was designed to enhance the availability and quality of assistive technology devices and services to all individuals, including very young children. The Tech Act defines an assistive technology device as "any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of children with disabilities" [P.L. 100-407, 29 U.S.C. 2202, §3(l)]. Assistive technology services are defined in the legislation as "a service that directly assists a child with a disability in the selection, acquisition, or use of an assistive technology device" [P.L. 100-407, 29 U.S.C. 2202, §3(2)]. Services include activities directed specifically to the recipient of the device (i.e., occupational therapy, physical therapy, speech therapy, and evaluations). Services also include supportive activities such as purchasing and leasing devices and equipment, customizing and adapting devices, repair of devices, training in the use of

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devices, and coordinating therapies, interventions, and services with assistive technology devices (National Information Center for Children and Youth with Disabilities, 1991).

Additionally, the passage of P.L. 99-457, now consolidated in the Individuals with Disabilities Education Act of 1991 (IDEA), mandates that assistive technology devices and services be among the early intervention services that can be included in the Individual Family Service Plan (IFSP). This legislation reveals a clear intent for professionals to facilitate greater family involvement in assistive technology decision-making processes (McGonigel, Kaufmann, & Johnson, 1991; Noonan & McCormick, 1993; Rosin, Whitehead, Tuchman, Jesian, & Begun, 1993). The development and implementation of IFSPs reflects a shift toward family-centered intervention services. A family-centered approach recognizes the family as the constant in the child's life and as the primary decision maker in all decisions for their child (McGonigel et al., 1991).

Given the growing importance and use of assistive technology devices in the context of family-centered intervention practices for young children with disabilities (Brotherson, Cook, & Parette, 1996; Judge & Parette, in press; Parette & Brotherson, 1996), a process of assistive technology decision making that supports and involves families in assistive technology assessment and use for their young child with disabilities seems warranted. This article focuses on three issues pertaining to family-centered assistive technology decision making: (a) parent-professional partnership building, (b) assistive technology decision-making domains, and (c) culturally sensitive practices. Team collaboration in each of these decision-making processes is discussed, emphasizing the involvement of related services personnel and early intervention professionals collaborating with the child and family members. Multidisciplinary assistive technology teams are necessary, as no one individual or discipline will have all the information available regarding the range of assistive devices that might be helpful for a young child (Smith, Bow, & Hall, 1994). The team is guided by the family and is responsible for making collaborative decisions to meet the needs of both the family and child.

Parent- Professional Partnership Building

Current practices in family-centered early intervention highlight the importance of parent and professional partnerships (Dunst, Trivette, & Johanson, 1994; Rosin, 1996). Operationally, a parent-professional partnership is defined as an association between a family and one or more professionals that functions collaboratively, using agreed-upon roles in pursuit of a common interest (Dunst & Paget, 1991). Through parent-professional partnerships, opportunities are created for partners to become empowered to make informed decisions about the best course of action to achieve a common goal or interest.

A family-centered approach to assistive technology considers partnership building as a mechanism for empowering families to be involved in all aspects of assistive technology assessment and service delivery. This approach to the implementation of assistive technology contrasts sharply with the traditional role relationships between professionals and families. Family involvement during assistive technology assessment and implementation has often been limited to that of information provider and trainer rather than decision maker (Parette & Angelo, in press). Use of partnerships encourages shared responsibility and collaboration between the family and professional rather than client-professional relationships focused solely on the child.

Partnerships are characterized by certain features that make them different from other types of cooperative endeavors. First, the decision-making process in all aspects of assistive technology assessment and intervention must consider the changing needs of the family and allow for such flexibility. A major duty and responsibility of the professional is to provide all necessary information that will assist the family in evaluating different options so that the parents can make informed decisions

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regarding the selection and use of the assistive technology device. The final decision, however, about what devices appropriately match the needs of the child, what goals and interests should be pursued, and what courses of action will be taken to attain stated intentions rests solely with the family. Otherwise, lack of consensus may occur, resulting in limited device use by the child and family (Allaire, Gressard, Blackman, & Hostler, 1991; Culp, Ambrosi, Berniger, & Mitchell, 1986) or abandonment of assistive devices (Batavia, Dillard, & Philips, n.d.; Batavia & Hammer, 1990; Culp, 1987; Dillard, 1989; Galvin, n.d., a, n.d., b). Even if the professional disagrees with the family's decision, parents still need the professional's encouragement after the decision has been made.

Second, partnerships developed between the family and professionals evolve from mutual bust, honesty, respect, open communication, and respect for cultural diversity (Parette, in press-a). Honesty, trust, and commitment are the backbone of any effective helping relationship and are absolutely necessary for a partnership to be effective (Dunst & Paget, 1991). Professionals who enter into collaborative arrangements with families must give complete loyalty to the partnership; provide families with relevant, accurate, and up-to-date information; and use effective communication skills so that trusting partnerships can be developed and enhanced. The professional must be able to confer confidence in the family and understand the responsibility of providing the necessary information so the family can make informed decisions regarding appropriate assistive technology services for their child. This is an important step in creating an equal partnership and putting the parents on equal ground with the professional, assuming that the family desires equality in the relationship.

Third, partners recognize the benefits of a collaborative arrangement and openly agree to pool their respective resources (e.g., knowledge, skills, past experiences) and to work toward a mutually agreed-upon goal or interest. Both the parent and professional must discuss the assistive technology "joint venture" and then proceed to define the mutually agreed upon roles that will be used in the development of the partnership. This process is driven by family-identified needs, resources, routines, and values. The family is provided opportunities to evaluate the progress made at various times during the process and to renegotiate the mutually agreed-upon roles as well as the goals.

Partnerships in early intervention benefit everyone involved, including the child (Dunst, Trivette, & Deal, 1994; Rosin, 1996). Building partnerships with parents and involving them purposefully and meaningfully at multiple levels within the assistive technology decision-making process while providing them with options regarding their types and degrees of involvement will facilitate the development of family-centered, culturally competent technology services.

Assisitive Technology Decision-Making Domains

Earlier reports have suggested that when making decisions about assistive technology devices and services, four interrelated domains should be the focus of professional and family assessment efforts. These include child characteristics, family issues, technology features, and service system issues (Judge & Parette, in press; Parette, in press-b; Parette & Angelo, 1996; Parette & Brotherson, 1996; Parette, Hourcade, & VanBiervliet,1993). When professionals are identifying appropriate assistive devices for any young child with a disability, an examination of the relationships among the four domains is necessary (Parette & Angelo, 1996) (see Figure 1).

Child Factors

Team members involved in assistive technology assessment processes must examine specific child-related factors to identify appropriate technology that can be used by the young child with disabilities and the family. Appropriate assistive technology devices (a) are related to specific and clearly defined goals that are meaningful to the child and family, (b) are compatible with practical constraints (e.g., available fiscal and human resources or amount of training required for the child and others to use the technology), and (c) should result in the child and family achieving desirable and sufficient outcomes (Office of Technology Assessment, 1982; Parette, in press-b). Since the provision of assistive technology is linked to the development of the IFSP, devices and services should be viewed from the perspective of child strengths and needs in naturalistic settings.

Initial Assessment As a Starting Point

The team should consider the child's present levels of development in gross and fine motor, cognitive, communication, social and emotional, and adaptive development to provide an initial starting point for assistive technology decision making. Such information is generally available at the time a child is placed in a particular service setting. This preliminary assessment information provides a tentative starting point for examination of child characteristics by providing the team with important information relating to the child's functioning in various domains. An understanding of the *child's gross and fine motor abilities* will help the team to best select devices that can be held, manipulated, or transported by the child in naturalistic settings. *Cognitive skills* become important considerations given that certain devices require higher levels of cognitive ability to use efficiently. An understanding of the child's *communication skills* enables the team to identify the language that will be associated with the use of appropriate augmentative and alternative communication (AAC) devices. This also becomes an issue when children must use assistive technology devices cooperatively with others. Information regarding the *child's social and emotional skills* enables the team to effectively consider assistive technology devices that (a) may require focused concentration by the child, (b) will be used in play settings with other children (e.g., requiring

AAC Decision-Making Domain	Factors for Team Consideration
Child	*The team should consider the child's:* • gross and fine-motor abilities • cognitive skills • communication skills • social and emotional skills • adaptive development • age • gender • past experiences in using technology • training needs • desire for independence • current devices used • physical location of the child
Family	*The team should consider the family's:* • resources, priorities, and needs • need for information • expectations for assistive technology devices • understanding of device features and capabilities • willingness and ability to be involved in implementation of the device • willingness to assume decision-making roles • increased stress levels during device implementation (continued)

Figure 1. Domains and factors for team consideration during assistive technology decision making.

Figure 1. Continued

AAC Decision-Making Domain	Factors for Team Consideration
Technology	*The team should consider the:* • range of devices available • potential to increase child performance levels • cost (including hidden expenses) • ease of use • comfort • dependability • transportability • longevity and durability • adaptability • compatibility with other devices • hands-on opportunities • safety features • repair considerations
Service System	*The team should consider the:* • cost of the device • protection from theft and damage available • early intervention personnel training needs • transportation needs • transition needs
Cultural	*The team should consider:* • family ethnic characteristics and values • degree of enculturation reflected by child and family • social characteristics of family having a cultural base • child and family life course and experiences

turn taking), or (c) are responsive to variable emotional states (e.g., a child with behavioral problems who is aggressive toward or with objects). Finally, recognition of the child's *adaptive development* (e.g., self-sufficiency, independence) will help the team understand the extent to which the child can be expected to use an assistive technology device in naturalistic settings.

Other specific device-related issues must also be considered. The child's *age* is important, because certain assistive devices have been designed specifically for use with young children. *Gender* may become an important issue with some families from different cultures. Specific colors or materials used to cover or transport devices may be viewed by the family as being more appropriate for a child of a different gender (e.g., blue used for male infants or toddlers). Similarly, an AAC device that has a male voice might be considered to be inappropriate for a female child. The child's *past experiences* in using assistive technology devices are of particular importance, as this information provides insights regarding both successful and unsuccessful interactions that can guide decision making (Huer & LIloyd, 1990). *Training needs* associated with any assistive technology device will have an impact not only on the child but also on professionals and family members, as all person's in the child's naturalistic settings may need to learn to use the device (Behrmann, 1995; Carey & Sale, 1994; Culp el al., 1986; Garland & Linder, 1994; Inge, Flippo, & Barcus, 1995; Margalit, 1990). The child's *desire for independence* (or the family's desire for the child's independence) may be an issue for some families, particularly from a cultural perspective, and influence decisions regarding the most appropriate device that will address the family's priorities, concerns, and resources. Some children will not have the same desire for independence as children in the dominant culture, and families may nurture dependence of the child on the family. *Child preferences* for devices may be an issue for toddlers who are beginning to make choices and show early preferences for devices constructed of specific materials or that have features that are novel and of interest to the child. Although family members often report little consideration being given to the child's preferences during decision making (Hutinger, 1994; Parette & VanBiervliet, 1995), professionals have typically reported that user preferences are considered (Van Dyck, Allaire, & Gressard, 1990). However, the influence of assistive technology on young children's opinions varies markedly depending on the developmental age of the child and developmental status (Allaire et al., 1991). *Current devices used* also provide team members with information necessary for decision making, enabling team members to examine the efficiency with which a child can use a particular device. Such information also allows the team to evaluate the child's potential to use more sophisticated devices that might potentially be considered. *Physical location of the child* refers to the naturalistic setting in which the assistive technology device may be used. Devices that will be used across several naturalistic settings will need to be transported. Wheelchairs and other mobility devices may require environmental modifications to enable efficient operation.

Family Factors

Successful use of assistive technology requires team-based assessments that lead to identification of appropriate devices and services. This occurs when family members play an active role during the assessment process and assistive technology decision making is a collaborative effort between family members and professionals. When family and child's needs, Preferences, abilities, and experiences are riot considered in the assessment process, the selection of the device will most likely lead to limited use (Allaire et al., 1991; Culp et al., 1986) or its abandonment (Parette & Angelo, 1996; Scherer, 1996). Abandonment of devices has far-reaching implications, including (a) an exacerbation of the effects of disability experienced by the infant or toddler who could potentially benefit from their usage (Brody & Ruff, 1986), (b) excess personal and financial costs (Luborsky, 1993; Parette, 1996), and (c) inefficient use of finite service system care and resources (Bradley, Parette, & VanBierviiet, 1995; Parette, Brotherson, Hourcade, & Bradley, 1996).

An underpinning of family-centered practice is that professionals give deference to resources, priorities, and needs identified by families during decision-making processes. Planning for the delivery of appropriate assistive technology devices and services cannot be accomplished successfully without information related to what is valued and needed by the family. This requires an understanding of family needs. Of particular importance is the need for information (Angelo, Jones, & Kokoska, 1995; Angelo, Kokoska, & Jones, 1996; Hutinger, 1994; Parette & Angelo, 1996; Parette & Brotherson, 1996; Parette & Van-Biervliet, 1990a, 1990b, 1990c, 1991). Consequently, it is critical that professionals working with family members clearly understand the expectations that families have for assistive technology devices. They must also provide meaningful information to families regarding device features and capabilities as well as anticipated involvement of families and intervention personnel (e.g., training, meetings, teaching the child to use the device) to ensure successful implementation of the device.

Families sometimes view the judgment of professionals as being more important than their own (Fewell & Vadasy, 1986; McBride, Brotherson, Joanning, Whiddon, Demmitt, 1993). Such perceptions may be especially true for some families from non-European backgrounds. This transfer of decision-making power to professionals who are viewed as knowing what is best for the family may contribute to the loss of much valuable information during the assistive technology assessment process. Information that might potentially be lost includes the identification of family resources and solutions that have been successful to address child needs (Parette & Brotherson, 1996). This information is critical during the assessment process because it can identify family solutions that may be better than any solutions that technology might provide. It may also result in a failure to address specific needs that families have related to assistive technology decision making.

Kaplan (1996) notes that technology is merely a tool, and compromises may need to be made during decision making. What children and families receive may not be what is best, as perceived from a technical point of view by professionals, but rather what the child and family believe they can accept (Parette, Brotherson, Hourcade, et al., 1996). Studies have shown that higher levels of stress may occur if (a) increased caregiving demands are placed on families (Angelo, 1997; Haddad, 1992; Harris, 1988; McNaughton, 1990; Murphy, 1988; Parette, Brotherson, Hourcade, et al., 1996), (b) great amounts of time are required for family members to provide team-identified interventions (Brotherson & Goldstein, 1992; Parette & Angelo, 1996), and (c) specific assistive devices are provided that require family time and resource commitments (Allaire et al., 1991; Angelo, 1997; Brotherson, Oakland, Secrist-Mertz, Litchfield, & Larson, 1995; Culp et al., 1986; Mc-Naughton, 1990; Parette, 1994, 1996).

If appropriate assistive technology devices are to be identified and IFSP implementation is to be effective, family members need to be involved in team decision making. Differing concerns and priorities for assistive technology devices and services can result in parent-professional dissonance, family and child dissatisfaction, and unsuccessful assistive technology outcomes (Angelo, 1997; Angelo, Jones, & Kokoska, 1995; Parette, 1994; Parette & Angelo, 1996). It is important that the recommendations proposed by professionals are congruent with those identified by the family.

Assistive Technology Device Features

Specific features of assistive devices are typically examined after an understanding of the child's characteristics and family factors have been determined (Inge & Shepherd, 1995; Parette, in press-b). As there may be numerous aspects of devices crucial to making an appropriate selection for the young child with a disability, such an examination should be more than cursory in nature. *The range of devices available* that may potentially enable a child to benefit from early intervention should be examined. A review of products advertised in various catalogs can provide the team with potential devices that might be appropriate for the child. Vendors may also be contacted and requested to provide demonstrations and hands-on opportunities for children and families to use devices that are being considered by the team. Additionally, many state projects funded under P.L. 103-218, the Technology-Related Assistance for Individuals with Disabilities Act of 1994, have demonstration centers that afford families hands-on experiences with a range of assistive technology devices. On-line resources for families and professionals have become increasingly important sources of information. Presented in Table 1 are sample sites that may assist team members during assistive technology decision making.

The assistive device's *potential to increase performance* levels must also be carefully examined. Once a child's performance levels are known by the team, a plan may be developed that addresses the family's priorities, concerns, and resources. Many assistive technology devices are designed to perform specific functions in naturalistic settings, whereas other devices may have multiple uses across tasks; and settings (Parette, in press-b). Some devices will be accompanied by product manuals that provide documentation regarding device functions and limitations. If such documentation is not available, team members may need to directly examine devices being considered by requesting product demonstrations by vendors or obtaining information from families who have used assistive devices being considered.

The *cost* of assistive technology is often identified as a primary barrier to acquiring technology for children with disabilities (Hayward, Tasjian, Wine, & Curtin, 1992; Parker et al., 1990; Uslan, 1992). Of particular importance to the team is the *total cost* of the device, including hidden expenses associated with assembling, special batteries, parts, maintenance requirements, and additional assistive devices that are required to operate the device being considered (Parette, in press-b). When hidden expenses are initially explored, they may be written into the child's IFSP as an assistive technology service, with specified providers being identified to pay for the necessary services.

Ease of use, or simplicity of operation of an assistive technology device, is an important consideration for young children with disabilities as well as family members (Parette & VanBiervliet, 1990a, 1990c, 1990d). When complex devices are prescribed that require training-time commitments by service providers, family members, and children, reluctance to make such time investments may sometimes be anticipated (Parette, Brotherson, Hourcade, et al., 1996). Additionally, if the cognitive or motoric demands of the device exceed the child's performance levels, the child and family may be resistant to using the device, resulting in technology abandonment (Batavia et al., n.d.; Dillard, 1989; Phillips, n.d.).

Comfort of assistive devices has also been identified as a potential factor for consideration during decision making (Parette, in pressb; Parette & VanBiervliet, 1990a, 1990d). Careful thought must be given to the physical demands placed on the child to operate or use any assistive technology device_and the level of comfort experienced during use in naturalistic settings. Some devices may be used with great ease and comfort, whereas others can only be used for short periods before the child will become tired or uncomfortable.

Dependability of the device includes the extent to which (a) device performance matches manufacturer claims and (b) the device meets the needs of students (Galvin, n.d., a, n.d., b). Team members must examine the ability of assistive technology devices to provide performance or evaluation data necessary for the documentation of the child's progress toward meeting goals that reflect the family's priorities, concerns, and needs. When information regarding device dependability is not available, team members may contact persons with disabilities who have used the device to obtain their perspectives of dependability.

Transportability of the device across and within naturalistic settings may also be an important factor for team members to consider (Batavia & Hammer, 1990; Parette & VanBiervliet, 1990a, 1990d). Sometimes bulky or heavy devices may be chosen for young children who may not have the strength to carry them around (Carey & Sale, 1994). This places responsibility on adults working with the child to ensure the availability of the assistive technology device for targeted tasks identified in the IFSP. Smaller devices may be cumbersome for some young children to transport, requiring a special case, satchel, or bag (Parette, in press-b) or a designated adult to assist in transportation across environmental settings.

Longevity and durability of devices become important considerations given that some assistive devices must be handled carefully and cannot be subjected to even moderate abuse (e.g., drooling, spills, being dropped), whereas other devices are specifically designed to resist rugged use by young children with disabilities. Product manuals should be examined for information regarding longevity and durability; if unavailable, direct contact with the manufacturer may be helpful (Parette, in press-b).

Because many technologies will be used for a long time, *adaptability* to meet the changing needs of children over time must be carefully considered (Galvin & Toonstra, n.d.; Parette & VanBiervliet, 1990a, 1990d; Philips, n.d). Devices that may be used across many naturalistic: settings may be preferable (and more cost-effective) to those that perform only one function. However, some devices are designed to perform a specific function and

Table 1 Selected Assistive Technology Information Resources on the World Wide Web (WWW)

Site	WWW Address	Overview of Information Available
Trace Research and Development Center	http://trace.wisc.edu	Wide range of textual information regarding assistive technology; electronic databases containing technical information about products, services, and over 20,000 devices
Alliance for Technology Access	http://www.ataccess.org/	Links information from a nation network of technology resource centers and technology vendors: 41 community-based technology centers in 27 states and the Virgin Islands and 60 technology designers and developers
RESNA Technical Assistance Project	http://www.resna.org/hometa1.htm	Provides information and consultation to assistive technology programs in states and territories funded under the Technology-Related Assistance For Individuals With Disabilities Act as amended.
ERIC Clearinghouse on Disabilities and Gifted Education	http://www.cec.sped.org/er-menu.htm	Provides information on the education of individuals with disabilities as well as those who are gifted. We also provide access to information from a variety of sources outside our clearinghouse, the ERIC System, and the U.S. Department of Education
Equal Access to Software and Information (EASI)	http://www.rit.edu/~easi/	Provides information and guidance in the area of access-to- information technologies by individuals with disabilities; updates on the adaptive computer technology developments and advancements
Center for Applied Special Technology (CAST)	http://www.cast.org/	Develops and publishes information regarding innovative uses of computer technology; develops universally designed learning tools and materials and assists service providers in solving access issues for schools and individual children.

cannot be adapted. Before an assistive technology device is purchased, team members should identify potential modifications needed for the device over time. Such needed modifications should then be weighed against available fiscal and human resources in the service system (e.g., early intervention personnel, community volunteers) necessary to make the needed modifications.

Compatibility with other devices, or the extent to which a device being considered can be used with other assistive technology, may become an important consideration for some young children with disabilities. Team members should give thought to both the child's present and future needs when examining the ability of the technology to be used with other devices (Hutinger et al., 1990; Parette, in press-b; Parette, Brotherson, Hourcade, et al, 1996).

Hands-on opportunities have repeatedly been identified as prerequisites to assistive, technology decision making by both family members and persons with disabilities (Hayward & Elliott, 1992; Hutinger, 1994; Parette & VanBiervliet, 1990a, 1990d). Effective team members should attempt to ensure that the child has an opportunity to use an assistive technology device before purchase (Galvin & Toonstra, n.d.; Parette et al., 1993).

Safety features should be a consideration during team decision making, as not all assistive technology devices may be safe for use with all young children with disabilities. Small devices that could be easily swallowed might not be appropriate for young children having a tendency to mouth objects (Parette, in press-b). Other devices might have sharp edges that could injure young children during a fall or handling, whereas others might cause electric shock if placed in water.

Because some assistive devices require lengthy or frequent repair intervals, *repair considerations* may be considered by team members during decision-making processes (Batavia and Hammer,1990 Parette & VanBiervliet, 1990a; Phillips, n.d.). Team members should request information from vendors about product testing, reliability, and repair records for devices. Persons in the community who use devices being considered should be contacted to obtain a user perspective regarding repair issues. Team members should also ask vendors whether the child and family will have a backup or "loaner" device provided by the manufacturer while the device is being repaired and whether a warranty is available. If a warranty is not available, team members may identify (a) local shops or companies that can provide parts or repair damaged devices or (b) parents, family members, and early intervention personnel who might have the tools and skills to repair assistive technology devices (Parette, in press-b).

Service System Factors

The fourth area of concern that has traditionally been addressed by the IFSP team includes factors directly related to the service system's ability to provide needed assistive devices and services. Several factors that may be important to families when, considering different assistive technologies are cost, protection from theft and damage, early intervention personnel training needs, transportation, and transition needs.

Financing of assistive technology devices is sometimes perceived by professionals as the most important service system issue (Church & Glennen, 1992b; Klein, Walker, & Foster,1994/95; Parette, in press-b; Parette, 1997; Wallace, 1995). Assistive technology services identified in P.L. 102-119 include evaluations, purchasing, leasing, maintenance, repair, training, and other services (34 CFR§303.12). However, the reality of potentially limited funding of the Part H (now Part C) system (Gallagher, Harbin, Eckland, & Clifford, 1994) presents a major challenge to team members and underscores the effective practice of *identifying appropriate technologies* for young children with disabilities. State, federal and private sources other than Part H funds (e.g., Medicaid, Social Security Administration, CHAMPUS, private insurance) typically must be accessed (Mann & Lane, 1991; Parette & Judge, in press; Parette & VanBiervliet, 1991; Wallace, 1995). Often, inexpensive assistive devices or those that can be modified, customized, or made by the service system personnel at minimal cost may be appropriate for some young children with disabilities (Parette & VanBiervliet, 1990a). Team members may consider leasing as an alternative to purchasing expensive devices, thus minimizing hidden expenses (Aparatek, Inc., n.d.; Hofmann, 1994; Parette, in press-b; Parnes, 1988). Another effective practice solution is to use community resources as an alternative funding source when severe fiscal resource limitations are present (Parette, Murdick, & Gartin, 1996).

When devices are prescribed for young children with disabilities, *protection from theft and damage* may become an issue. This is particularly true when young children will be using devices across a range of naturalistic settings. Although a particular facility where early intervention services are provided may have coverage for theft or damage while a device is on-site, liability issues may need to be examined if the device leaves the facility (Parette & VanBiervliet, 1990a, 1990d).

Integrally linked to the financing of assistive devices *are early intervention personnel training needs* (Behrmann, 1995; Carey & Sale, 1994; Culp et al., 1986; Garland & Linder, 1994; Inge et al., 1995; Lesar, 1998; Margalit, 1990). Effective team members should not ignore the necessity of training personnel in the appropriate use of assistive technology devices (Church & Glennen, 1992a; Parette, 1991; Parette, Brotherson, Hourcade, et al., 1996). Although many assistive devices can easily be used without training, more sophisticated devices (e.g., keyboard emulators, nondedicated speech devices, environmental control systems) may require considerable early intervention personnel training commitments. Thought should also be given to the attitudes held be professional who require training in the use of assistive devices. Some professional *do not want to learn* to use technology, just as some children show no interest in using specific applications (Hutinger, 1994). Professionals' opinions of how successful they think the outcome will be determines whether they make the device accessible to the child (Hutinger,1994; Parette, 1996). A study by Moratinos (1995) found that teacher perceptions of students' abilities to learn to communicate were the strongest predictors of their intentions to provide and use AAC systems in classroom settings. These perceptions, however, were also found to be strongly affected by their own skills and responsibilities to provide AAC training in the classroom (Moratinos, 1995).

Although technology benefits for young children with disabilities and their families may occur after their delivery, the resources of the service delivery system; belief in technology benefits; technology competence of professionals who work with the child and family; the child; and the interest, resources, and persistence of families all appear to be related to positive outcomes (Hutinger, 1994).

Transportation may become an issue for some children, particularly when medical technologies (e.g., apnea monitors, respirators) or powered mobility devices must be transported across naturalistic or other service settings (Parette, 1991; Parette & VanBiervliet, 1990b). Team members should give careful consideration to the coordination of services necessary to ensure that assistive devices prescribed for young children with disabilities may be safely and efficiently transported within and across service systems.

Transition needs of individual children and families must be addressed as part of the IFSP (P.L. 102-119, 34 CFR §303.344; Hanson & Lynch, 1995; Stayton & Karnes, 1994). Infants and toddlers withh disabilities may require varying types of assistive technology devices across environmental settings. Device needs may also change as the child transitions into various components of the service system (e.g., hospital to home, home to center-based program, center-based program to preschool) (Fowler, Hains, & Rosenkoetter, 1990; Hanline & Deppe, 1990). In all instances, team members will need to consider assistive tecnology devices and services for the child and family that will ensure smooth transitions (Noonan & McCormick, 1993).

Culturally Sensitive Practices

Although considerations of child characteristics, family factors, device features, and service systems issues are important in the assistive technology decision-making process, cultural and ethnic factors have become increasingly important in assistive technology decisions making (Hetzroni & Harris, 1996: Parette, in press-a, b; Parette et al., 1996; Soto, Huer, & Taylor, 1997). Cultural issues specific to the child and family also need to be considered, because culture (a) influences both child and family also need to be considered, because culture (a) influences both child and family views of the world and their relationship with others, (b) affects the degree of independence desired by the child and family, and (c) may impact the type of assistive technology device desired by the child (Parette, 1996; Parette, Brotherson, Hoge, & Hostetler, 1996). Similarly, the influence of acculturation, developmental expectations, social influences, and life experiences on the process of assistive technology decision making may become critical components of future decision making (Luborsky, 1993; Parette, 1996). Figure 2 presents the relationship among these variables in the context of family-centered assistive technology decision making.

Within the framework of the family, young children with disabilities and family members are affected by the dominant or mainstream culture, social influences, life experiences, and developmental expectations across the life span. Embedded within the complex family framework are additional influences related

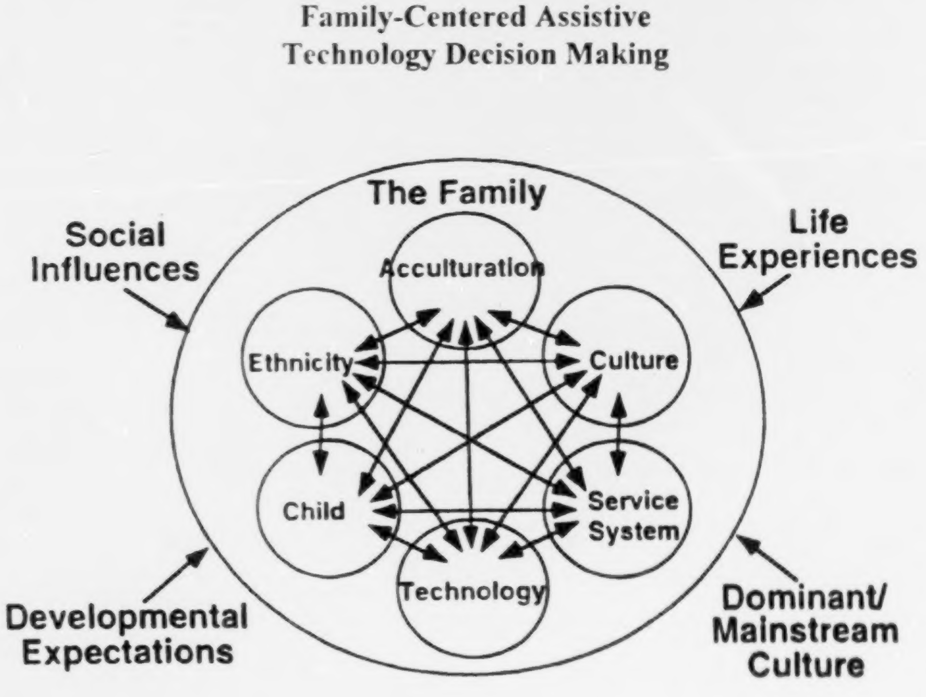
Family-Centered Assistive
Technology Decision Making
The Family
Social Influences
Life Experiences
Acculturation
Ethnicity
Culture
Child
Service System
Technology
Developmental Expectations
Dominant/ Mainstream Culture

Figure 2. Culturally related influences on assistive technology decision making. ©1997 by Howard P. Parette, Jr. Reprinted with permission of the author.

to assistive technology decision making, which include the unique culture background of the family, ethnicity, and acculturation factors. More traditional domains within the family that influence assistive technology decision making include child characteristics, device features, and service systems issues.

Ethnic factors have important implications for professionals working with young children with disabilities and their families. Despite the recognition of differences among families from varying ethnic backgrounds, professionals in special education have historically expected families to adapt to the expectations of the Euro-American culture (Correa, 1987). For example, Parette (1996) reported that electronic AAC devices are typically designed to produce Euro-American voices. Some families may prefer to have their children speak by using a particular dialect, such that the children can clearly be associated with a special ethnic group (Parette, Brotherson, Hoge, et al., 1996).

Families from diverse cultural backgrounds will also be influenced to use assistive technology to degrees by *acculturation factors*. These factors can include geographic and social isolation of the family from exposure to technology (Torres-Davis & Trivelli, 1994). Families from rural areas may not have been exposed to information about or seen assistive devices used by young children prior to meeting with professionals during team decision-making processes. This lack of technology acculturation may have a significant effect on their willingness to use assistive technology. Conversely, families who reside in urban areas may have had considerably more exposure to and information about as assistive technology, thus influencing their ability to make decisions using a broader knowledge or experiential base than families from rural settings.

The challenge to multidisciplinary early intervention team members, then, is to recognize that the provision of appropriate assistive technology first begins with a sensitivity to the influence of culture and ethnicity (Buzolich, Harris, Lloyd, Soto, & Taylor, 1994), because these influences help to shape the identities of persons as individuals and as family members (Hanson, 1992). Once heightened sensitivity to cultural factors has been achieved by the professional, it is easier to understand how social factors, child and family life course, and life experiences have contributed to the family's perception of or need for assistive technology devices. This understanding will provide insights into the comfort with which the family may be able to discuss specific assistive technology solutions considered during team processes. This understanding will also assist the team in understanding the priorities, concerns, and resources of families during assistive technology decision making and enable the selection of devices from a more culturally sensitive perspective.

Conclusion

With the increasing emphasis on family-centered early intervention, family involvement must be of paramount importance when planning for implementation of assistive technology services. It is expected that multidisciplinary team members will increasingly participate in assistive technology decision making processes in the future. This is due to a variety of forces, which may include, but not be limited to, (a) greater emphasis on the *inclusion of assistive technology devices and services during IFSP development* across disciplines and funding streams (Wallace, Flippo, Barcus, & Behrmann, 1995); heightened *visibility of technology usage* in our society in general (Morgan & Shade, 1994; Roblyer, Edwards, & Havriluk, 1997); (c) increasing *availability of unique technology applications* to meet specific needs of individuals (Church & Glennen, 1992b); and (d) growing recognition of the importance of *inclusion of all individuals* the mainstream of Society and the potential of assistive technology to facilitate inclusion (Male, 1997).

Professionals across disciplines have the potential to create partnerships that can dramatically impact how families perceive assistive technology as a means for meeting the needs of young children with disabilities. Such relationships provide the cornerstone of early intervention programs. Although the selection of the assistive technology device is important,. the accommodation of the device within the family system and the child's routines and activities is more critical to the overall process.

Specific factors that should be given consideration by team members have been noted in Figure 1. Although many of these factors may play important roles in the effectiveness of assistive technology devices prescribed for young children with disabilities, it is perhaps family and cultural factors that are most susceptible to being overlooked by professional across all disciplines (Parette & judge, in press). It is vital that the multidisciplinary team involved in assistive technology decision making understand the influence of family and cultural factors in the ultimate acceptance or rejection of a particular technology solution identified. It may be that these factors receive less consideration due to the lack of training reflected in the inherent preparation programs of professionals (Neath, 1993: Taylor & Wiebe, 1994). Additional training in working with families, including developing skills in such areas as partnership building, consensus building, interviewing, counseling, consultation, collaboration, goal setting, and decision making is required if multidisciplinary team members are to most effectively serve young children who have disabilities and their families (Beukelman & Mirenda, 1992; Briggs, 1997; Donahue-Kilburg, 1992).

Table 2. Strategies for Effective Multidisciplinary Assistive Technology Decision Making with Families Across Cultures

Learn about the "collectivist" cultures of nonmainstream families
Be sensitive to the realities of family life, demands, arid routines
Understand that expectations and aspirations are related to culture
View each child and family as unique
Minimize the use of professional jargon
Listen to the communication needs of the child and family
Recognize that preferences differ between family and professionals
Discuss the value of and use of devices with extended family members
Collect information about past experiences and priorities in using assistive technology
Consider the child's home environment when prescribing assisitive technology
Select symbols that will be affixed to devices that represent the family's culture
Be sensitive to stigma-do not create "negative" attention to the child
Select a device that facilitates the child's acceptance into the community
Identify mobility issues related to assistive technology
Examine the options for the child and family during repair intervals

Source: Huer, M.B., Parette, H. P.. & Brotherson, M. J. (in press). Respecting family values and culture In A. VanBiervliet & H. P. Parette (Eds.) (CD-ROM), Families, cultures, and AAC. Little rock, AR: University of Arkansas for Medical Sciences ©1997, used with permission.

However, the issues that are sometimes raised by families are less culture specific. Instead, family issues may focus on the general need for clear, accurate, trustworthy, and straightforward communication (Parette, Brotherson, & Huer, 1997). Basic strategies and recommendations for professionals across disciplines are noted in Table 2. Such strategies should provide basic guidelines for working with families across cultures. They should also ensure that effective communication with and optimal participation of family memebrs occur on multidisciplinary decision making teams. An assistive technology decision-making process that takes into account the linkages between the domains of child, family, assistive technology device and service system factors and the use of culturally sensitive practices discussed in this article should result in the selection assistive technology devices or systems that promote a child's overall development and have a positive impact on the whole family.

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Reprinted with Permission by Singular Publishing Group, Inc. S.L. Judge and H. P. Parette, Family-Centered Assistive Technology Decision Making, *Infant-Toddler Intervention*. 8(2), 185, 1998.

Journal of Special Education Technology
12(4), 312-324

Applications of Technology for Infants, Toddlers, and Preschoolers with Disabilities

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This paper reviews research studies involving the use of technological interventions for direct educational application with children who have disabilities from birth to age five. Studies are organized relative to two categories present in the extant literature: adapted switch toys and microcomputer software. Methodological limitations and implications for future research are discussed for each category.

Technological advances of the past decade have affected virtually every facet of American life. The microcomputer-based technology available today can provide access to education and assist in the full inclusion that has been previously unattainable for some individuals with disabilities. Many benefits of using technology for enhancing the lives of school-aged and adult individuals with disabilities is well-documented in the literature (Lahm, 1989; Okolo, Rieth, & Bahr, 1989). For example, those who are nonvocal are able to communicate with others through augmentative/alternative communication devices. Adaptive devices for microcomputer systems (e.g. braille input and voice output) provide access to education for those with physical or sensory impairments. Similarly, electronic switches which operate stereos, videocassette recorders, fights, and kitchen appliances create opportunities for environmental control and leisure activities for others with severe disabilities.

Computer-based instruction also appears to have a positive impact on typically-developing preschoolers (Clements, 1987). Researchers have observed high levels of spoken communication and cooperation as young children interact at the computer compared to traditional activities (Clements, Nastasi, & Swaminathan, 1993). Computer software can also increase early mathematics concepts, prereading, and beginning problem-solving skills (Clements, 1987; Clements, Nastasi, & Swarninathan, 1993). One may also assume, therefore, that these same benefits are applicable to young children with disabilities. Unfortunately, there still appears to be a paucity of empirical research regarding the use of technological intervention with infants, toddlers, and preschoolers who have disabilities (Behrmann, Jones, & Wilds, 1989; Horn, Warren & Reith, 1992).

The existing body of literature concerning the use of technology in early childhood special education is primarily non-empirical. For example, there are articles describing techniques for implementing technology in preschools and home environments (Behrmann & Lahm, 1984; Meyers, 1986; Robinson, 1986; Schaeffler, 1988), editorials (Johnson, 1986), expository papers (Hutinger & Brinkley, 1986; Watson, Chadwick, & Brinkley, 1986), selective reviews (Behrmann et al., 1989; Porter, Lahm, Behrmann, & Collins, 1986), and descriptive case studies with no experimental control or empirical data (Grant & Semmes, 1983; Reeson & Ryson, 1988). These papers lend valuable information as to what types of technology are available and how technology is actually being implemented with young children who have special needs. However, additional empirical research is needed to document the effectiveness of this technology in promoting skill attainment in the basic developmental areas, as well as determine its potential for increasing social integration opportunities and full inclusion.

Some empirical studies with young children who have disabilities are available.

Unfortunately, several of those include preschool children along with school-aged children as subjects, thus making it difficult to sort out the effects of the treatment on the preschool children alone (e.g., Merbler, 1989; Schery & O'C Shriberg, Kwiatkowski, & Snyder, 1989). Our purpose for this paper is to review relevant research studies available in the literature involving the use of technological interventions with children who have disabilities from birth to age five. Based on this review, we will present the trends represented by the research literature and suggest implications for future investigations.

This paper is therefore organized relative to the following technological interventions which appear to represent major categories in the extant literature: (1) adapted switch toys and (2) microcomputer software in direct educational applications. The studies we included in this review were obtained through a search of relevant literature published between 1966 and 1992. Study sources included a computer search of ERIC and PSYCHLIT databases, a manual search of appropriate journals, including cross-references of relevant journal articles as well as published texts in the area of special education technology and early childhood special education. Articles meeting the following criteria were included: (1) studies were empirical in nature, (2) all subjects in the studies were from birth to age five, (3) subjects in the studies had an identified disability, (4) studies involved the use of technology for instructional purposes only, and (5) studies were published in refereed professional journals. Descriptive variables of each reviewed article are presented in Table 1.

ADAPTED SWITCH TOYS

Play is the primary vehicle for teaching and learning in the early years of life. Many children with severe physical disabilities or sensory impairments are unable to manipulate typical toys. Therefore, battery-operated toys are adapted to work with single switches, and children with disabilities can activate the toy by pressing the switch using some type of controlled physical movement. A switch can also work with a microcomputer as a mediator between the switch and the adapted toy. There are four studies which examined the use of switches with young children who have disabilities; (Brinker & Lewis, 1981; Horn & Warren, 1987; Horn, Warren & Reith, 1992; and Meehan, Mineo & Lyon, 1985).

Brinker and Lewis (1981) measured the effects of a microcomputer-based contingency intervention to increase motor movements in infants with developmental delays. Later publications by Brinker and Lewis (1982a & 1982b) provide additional detail about the original study which we include here for clarity. None of the five infants in the study had shown an interest in looking at, manipulating, or reaching for objects. Dependent measures consisted of two types of infant responses: a) pulling a string attached to their wrist, and b) leg kicking. These infant responses activated electronic switches linked to an Apple II microcomputer which controlled the relationship between movements and consequences. During the first intervention phase, only one of the responses produced a consequence. During the second intervention phase, the previously unreinforced response produced a consequence and the previously reinforced response produced no consequence. According to the authors, results indicated that the four infants with Down's Syndrome exhibited differentiation of the reinforced responses from the nonreinforced responses, but the infant with developmental delays did not. Performance data was extremely variable. Unfortunately, a graphic display of the entire study was not made available for analysis although a few representative sessions were shown.

Meehan, Mineo, and Lyon (1985) examined the effectiveness of a prompt-fading strategy to teach a switch activation response. The participant was nonvocal, nonimitative, and exhibited no functional means of communication. The dependent measure was described as the percentage of 30-second trials (following a verbal and/or physical prompt) in which the

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TABLE 1
Descriptive Variables of Reviewed Articles

Study	Subjects	Setting	Dependent variables	Measurement	Independent variables	Research design	Results/remarks
Briker & Lewis (1981)	3 M; 3 F; 3.5-12.5 mos. 4 downs syndrome 1 developmental delays	Homes	* Pulling string attached to wrist * Leg kicking	Not specified	* Phase 1 -one response produced a consequence. * Phase 2-previously unreinforced response produced a consequence. * Consequences were switch-activated toys.	Multiple-baseline	Children with Downs Syndrome exhibited differentiation of the reinforced responses from the nonreinforced responses.
Fazio & Reith (1986)	20 mild and moderate intellectual disabilities, behavior disorders, communication impairments	Special preschool classroom	* Number times child chooses computer * Amount of time child spends on computer *Name of software selected * Type of assistance required to use software	Not reported	Not specified	Exploratory	Substantial use of computer during free time. Average length of time on computer was 3.6-8.5 minutes. Top choices in software were all user-controlled. Adult aid decreased over time and peer aid increased over time.
Horn & Warren (1987)	2 M 17 & 24 mos. multiple disabilities	Isolated area near classroom	* Motor skills: sitting, pulling kneeling, batting four-point position	3-min probe sessions collected via microswitch/ computer 86-87% rel. on generalization probes	* Adaptive equipment * Microswitches * Adapted toys * Microcomputer-mediated system * Prompting vs. no prompting	Multiple-probe across behaviors	Substantial increases in target behaviors contrasted to baseline. generalization and maintenance near training levels.

(continued)

TABLE 1 (continued)

Study	Subjects	Setting	Dependent variables	Measurement	Independent variables	Research design	Results/remarks
Hom et al. (1992)	5M; 1 F 16 mos. – 5 yrs.; cerebral palsy with multiple disabilities	Special preschool classrooms	*engagement *target motor behaviors *teacher-delivered contingent reinforcement *teacher-delivered corrective feedback	scan observation code (90-98% rel.)	* Motor instruction package (adaptive seating, favorite toys) *Microcomputer-mediated package (adaptive switch, adapted toys provide contingent reinforcement, computer cues trainers to provide prompts)	A-B-A-B with second site replication	Higher child engagement, higher target behaviors, more consistent feedback and prompting in in computer condition. Little difference in teacher praise in two conditions.
Lehrer et al. (1986)	120 2.7-4.9 yrs. 76% with speech andlanguage impairments	Separate rooms within a special education preschool	* cognitive development * problem-solving * specific skill acquisition * affective development *language development	KABC nonverbal scale, CIRCUS, Brigance Inventory of Early Development, PLAI	Random assignment to one of three conditions: * Logo-based * drill and practice software * teacher-directed presentation	Generalized randomized block design	Significant differences obtained between LOGO and control conditions for problem-solving, and language; significant effects found between drill and practice software and control condition on specific skills; no diffences found in affective or cognitive development.

(continued)

TABLE 1 (continued)

Study	Subjects	Setting	Dependent variables	Measurement	Independent variables	Research design	Results/remarks
McCormick (1987)	5 M 3-5 yrs. 1-developmental delays 1-visual/hearing imapairments 3-typical development	Experimental room	* initiations * responses * imitations * self-directed vocalizations * play levels (parallel/ associative/ cooperative)	10 second interval recording from video tape (above 89% rel.) reported in mean percentage	Two sessions daily * play with a Fisher-Price Garage Set * microcomputer activity	Not specified	Mean percentage of "other-directed vocalizations" was similar in both conditions for subjects with disabilities. Self-directed vocalizations were higher in toy activity. Greater percentages of associative play in computer condition and greater percentages of parallel play in toy condition.
Meehan et al. (1985)	1 M 4.9 yrs. severe multiple disabilities	Enclosed area of special - classroom	Depression of electronic switch to activate a toy	30 sec. interval recording (100% rel	Baseline (verbal prompts only). Treatment (prompt-fading strategy).	Alternating treatments with sequential withdrawal	Switch activation increased during first treatment phase and remained high throughout study
O'Conner & Schery (1986)	3 M; 5 F 22-38 mos. 6-downs syndrome 1-developmental delays 1-severe emotional disability	Separate room in early intervention center	Vocabulary learning and use	Scores on: PPVT-R, PEAL-Comp. PEAL-Prod, PEAL-Parent, Initial Communication Processes Scale, Vineland	Computer intervention (PEAL software) vs. traditional intervention	Repeated measures (split plot) within-subjects	No significant treatment effect

(continued)

TABLE 1 (continued)

Study	Subjects	Setting	Dependent variables	Measurement	Independent variables	Research design	Results/remarks
Spiegel-McGill et al. (1989)	3-M; 1-F 4.7-5.2 yrs. 2-orthopedic impairments 2-mulfiple disabilities	Experimental room near integrated preschool class	• Socially-directed behavior with partner	Momentary time sampling; 30 10-sec (91.07-100% rel.)	3 play conditions: • microcomputer • remote-controlled robot •children only	Alternating treatments	Computer condition differentially affected students with multiple disabilities

student manually depressed an electronic switch which activated a battery operated monkey.

In baseline conditions, only verbal prompts were used. In subsequent phases, two sessions were conducted daily, alternating between two treatment conditions: verbal-prompting only (baseline) and physical prompting paired with verbal prompting. Baseline conditions were then reinstated. Results indicated that switch activation increased dramatically during the first treatment phase and remained at a high level for the remainder of the study. During the final baseline, the switch response was maintained at 100% for all sessions.

Horn and Warren (1987) examined the effects of a microcomputer-mediated teaching system on the sensorimotor skills of two children. Both children exhibited severe motoric delay, with minimal or no head erect, reach and grasp, trunk extension, and other early sensorimotor milestones. Training required a combination of adaptive equipment for supporting the child, microswitches to monitor the child's correct motor movements, adapted battery-operated toys for reinforcers, and an Apple IIe microcomputer as a mediator between the target responses and the reinforcers. Three motor skills were precisely defined, targeted, and trained for each participant (sitting, pulling, and kneeling for one and sitting, batting, and four-point positioning for another).

During baseline sessions prompting and contingent reinforcement were not provided, and the toys were randomly activated (non-contingent). In the training sessions, the teacher positioned the child, the switch, and the toy. During the first 3-minute segment, the trainer followed a prompting hierarchy, and during the second, the trainer provided no prompting and allowed the child to respond independently. Toys were activated contingently in both training sessions. Generalization probes were conducted the same as baseline, with the same motor response, but with the stimulus cues altered. Maintenance probes were conducted in the same manner as the unprompted training sessions 2 and 4 weeks after training was terminated. Data presented across all three target behaviors for both children indicated substantial increases in levels of performance when contrasted baseline. Both children performed at a level near training levels on generalization and maintenance probes. The third skill trained for both children showed the most rapid gain.

In an effort to replicate and extend the study described above, Horn et. al. (1992) compared the effects of a microcomputer-mediated teaching package and a motor-skills instruction package. Their intervention was designed to affect the quality of child engagement, performance of target motor behaviors, and teaching behaviors used with children with multiple disabilities. A paraprofessional and a parent volunteer, used as trainers in the study, were provided with specific implementation instructions in two 30-minute sessions. In condition A (the motor instruction package), the children were positioned in adaptive seating, and a set of 3 or 4 toys (favorite classroom toys, no battery-operated toys) for each child was available. The trainers were instructed to praise the children and use the toys as consequences. In condition B (the microcomputer-mediated teaching package), children were positioned in adaptive seating. An adaptive switch recorded and monitored the performance of target behaviors through a microcomputer-mediated software program. Adapted battery-operated toys which provided contingent reinforcement of target responses were available. The computer monitor cued the trainer when to provide verbal or physical prompts, and the trainer recorded prompts via a Powerpad.

Results from site 1 indicated substantially higher child engagement and performance of target motor behaviors during the computer conditions as compared to the motor instruction conditions, with similar results obtained from site 2. More consistent material contingent feedback from the battery-operated toys was demonstrated in the computer condition. Levels of no feedback were higher in condition A. There were few differences in teacher praise between the two conditions. Consequences of nonperformance consisted of verbal prompt, physical prompt, and no prompt. The ratios of both verbal prompts and of physical prompts to child nonperformance were consistently higher during the computer-mediated conditions.

Summary

In each of the studies reviewed above, the target behavior resulted in the switch activation of an adapted toy, either directly or through computer mediation. The adapted toys, therefore, acted as contigent reinforcers of desired behavior. In the earlies of the studies, Brinker and Lewis (1981), used adapted toys to teach "contingency awareness" to infants. This study simply demonstrated that a child's movement could be contingently reinforced by a switch activated toy. In a related study, Meehan et. Al. (1985) found that a prompt-fading strategy was effective in teaching a manual switch response which resulted in the activation of an electronic monkey.

In a logical extension to the earlier research, Horn and Warren (1987) developed and tested the effectiveness of a teaching system that included verbal cues and physical assistance. This instructional system was paired with switch activated adapted toys acting as contingent reinforcers in shaping new motor behaviors.

In a comparison study, Horn et al. (1992) determined that a microcomputer-mediated teaching package increased target motor behaviors at a greater rate than did a motor instruction package. A unique variable in this study involved the measurement of child engagement with adults and materials. Each of the four studies reviewed support the use of adapted switch toys as a contingent reinforcer for increasing target behaviors such as movement patterns. Additionally, three of the four studies (Meehan et. al., 1985; Horn and Warren, 1987; Horn et. al., 1992) used prompting strategies to teach switch activation. These results support the need to use prompting strategies to increase the probability that children will elicit a desired response (i.e., physical movement to activate the switch) and react to the reinforcers (i.e., toys). There were certain methodological aspects of these studies, however, that may serve to limit the impact of their findings.

Methodological Limitations

The studies discussed above provide a solid basis for future research and indicate that the use of adapted toys can be powerful motivator for children who have disabilities. There were methodological problems encountered by these researchers and understanding these problems can provide insight for improving future efforts. For example, most of the studies cited did not separate the effect of the discriminative stimuli (i.e., prompting systems) versus the effects of the consequences (i.e., adaptive toys). This problem may have been the result of unclear operational definitions of the independent variables.

Additionally, a clear mandate for using adapted switch toys as contingent reinforcers cannot be made due to the limited number of subjects in the studies. Single subject designs require a significant number of replications in order to clearly support treatment effects. Therefore, these studies, particularly those conducted by Horn, et. al. need to be replicated before a clear cause and effect between increased interactions and adaptive toys can be established.

Finally, generalization of the target behaviors was not addressed in most of the studies. Horn and Warren (1987) did show generalization of the target motor responses under different stimulus cues, but this was in a contrived situation. They did not include any measures of self-initiated use of the motor skills or measures in naturalistic environments.

Implications for Future Research

Considerable research is still needed in order to determine the benefits and limitations of using adapted switch toys with infants and preschoolers with disabilities. To date, several key issues have not been addressed in the existing literature. For example, the effects of adapted toys on increased play opportunities for children after they have learned to use the toys requires further study. One effect might involve the role of adapted toys in providing situations where social interactions increased between preschool children with disabilities and their typically developing peers.

In addition, studies should examine a variety of issues related to generalization and adapted toy use. One such issue involved the use of switches and whether learning one type of switch will generalize to the use of other switches with different characteristics. Also, once the use of switches has been taught, researcher can attempt to demonstrate if the switch use generalizes across types of reactive toys. Other issues related to the activation of switches and generalization could extend the switch use to other types of environmental control.

MICROCOMPUTER SOFTWARE

The number of microcomputer software programs for young children is continually growing, with a substantial amount of preschool software focusing on the instruction of language skills, specific preacademic activities such as matching, number recognition, and letter recognition, and problem-solving. There are five studies which have examined the use of educational computer software (Fazio and Reith, 1986; Lehrer et al., 1986; McCormick, 1987; O'Connor and Schery, 1986; Spiegel-McGill, Zippiroli, and Mistrett, 1989) with preschoolers with disabilities. Four of these five studies compare a computer software condition to another type of condition (Lehrer et al., 1986; McCormick, 1987; O'Connor and Schery, 1986; Spiegel-McGill, Zippiroli, and Mistrett, 1989). The final study documents the use of software by preschoolers during free time.

Spiegel-McGill et al. (1989) compared the effects of three different play conditions on social interactions between dyads of children. Of the four subjects, two had orthopedic disabilities and mild social interaction deficits, but were rated and ranked as being the most social and interactive of the nine children with disabilities in the integrated preschool class. Two of the children had multiple disabilities (severe speech/language delays and mild to moderate orthopedic impairment) and were rated as the least socially competent in the class. Each child with a disability was paired with a typically developing child from the same classroom. The study compared three play conditions: 1) a microcomputer only was turned on and available, 2) a remote-controlled robot only was turned on and available, and 3) the children had only each other to play with. In the computer condition, the software was changed daily and several different software programs and alternate keyboards were used. Data were collected for six daily sessions on the percentage of intervals each subject engaged in socially directed behavior with his or her dyad partner.

Results of the study indicated the computer condition differentially affected the subjects with the lowest social interaction ratings and multiple disabilities. These two subjects engaged in more socially directed behaviors when playing on the computer than during the other two conditions. The subjects with the highest social interaction rankings demonstrated similar performance across the three conditions.

McCormick (1987) compared the effects of a microcomputer activity with the effects of a traditional toy-focused activity on social and communication behaviors of five boys in an integrated preschool program. Student dyads were brought to an experimental room for two 10-minute sessions a day for three days per week for ten weeks. One session involved toy play with a Fisher-Price Garage play set. The other session involved a microcomputer activity with an Apple IIe computer, the Muppet Learning Keys keyboard and software. Students simply played as they wished, with no adult intervention.

The data collected differ from the dependent measures described by the authors. For example, the initiations, responses, and imitations data were collapsed into one category called "other-directed vocalizations." These results were reported in mean percentage of intervals for each dyad during toy play and computer activity, as opposed to an ongoing graphical representation of data, making it difficult to interpret the behavior represented. Total mean percentages of other-directed vocalizations during toy play and the computer activity were very similar in both conditions for one child with a disability, and only slightly higher in the computer condition for the other child with a disability. The mean percentage of intervals with self-directed vocalizations was higher during toy play than computer activity for both children with disabilities. The mean percentage of three play levels in toy play and the computer activity were presented for each dyad, with greater percentages of associative play (as opposed to parallel play) in the computer activity, and greater percentages of parallel play in the toy condition.

Lehrer et al. (1986) examined the effectiveness of two different software environments for 120 preschool children with special needs attending a special education preschool. Children were randomly assigned within blocks to one of three conditions: (1) Logo-based learning embedded in a narrative framework with an introduction to programming using a robotic toy, (2) commercially available drill and practice software keyed to the child's individualized education plan, (3) and a teacher directed presentation of a film strip with a question and answer session. Children were instructed in the environments for 12.5 weeks, three times per week for twenty-five minutes per session. Dependent variables consisted of: (a) cognitive development as measured by the KABC nonverbal scale, (b) problem-solving as measured by the CIRCUS-Think it Through Level A, (c) skill acquisition as measured by thirteen subtests of the Brigance Inventory of Early Development, (d) effective development as measured by The Classroom Behavior Inventory-Preschool Form, and (e) language as measure by the PLAI.

Extensive statistical analyses were performed and described within the study. In summary, significant differences were obtained between Logo and control conditions as indexed by the CIRCUS problem solving tests and the PLAI. Lehrer maintained that these effects indicate that the Logo environment may enhance the problem-solving skills of special needs children. Significant effects were found between the instructional software condition and the control condition on the Brigance Inventory. No significant effects were found with the affective development measure or the general cognitive development measure.

O'Connor and Schery (1986) compared the effects of a microcomputer-aided and traditional language therapy for developing communication skills in nonoral toddlers. Each subject received twelve 20-minute intervention sessions in each condition (traditional vs. computer) over a period of 6 to 10 weeks. Dependent measures included scores on the Peabody Picture Vocabulary Test-Revised Edition, a criterion -referenced test of the actual vocabulary items presented during intervention, parent report of the child's use of vocabulary items, and the classroom teacher's assessment of the child's language. The computer intervention condition consisted of the initial level of Programs for Early Acquisition of Language (PEAL) software. Vocabulary was presented through theme contexts using actual toys and items (windup context and purse context). An Apple IIe microcomputer with Unicorn keyboard and Echo II speech synthesizer were also used. In the traditional intervention sessions, the toys from the training context (windup/purse) not used in computer condition were introduced, commented upon, and played with in semi-structured interactions.

Subjects served as their own controls. Dependent variables were summed by combining scales and subscales with similar outcomes and grouped into language skills (including several expressive and receptive measures) and prelinguistic skills. The rationale for summing these scores was that there were too many outcome variables to analyze on the sample of eight subjects. Results did not show a significant treatment effect.

Fazio and Reith (1986) examined the use of microcomputers during free play with preschoolers with disabilities. Students were divided into two groups on the basis of their IQ score. Ten students were referred to as the "higher functioning" group (IQ's ranging from 65 to 105 with a mean of 80) and 10 as the "lower functioning" group (ranging from 36-65 with a mean of 51). The children were observed during free-time once a week for 30 weeks. Data collected included the number of times a child chose to work at the computer, the amount of time the child spent on the computer, the name of the software they selected, and the type of assistance the child required to use the software.

The percentage of free-choice periods during which the children chose to use the computer was reported in mean percentages for the two groups. Both groups used the computer extensively all year (84% and 70%), with usage decreasing over time for the higher functioning group, but remaining fairly stable for the lower-functioning group. The average length of each interaction with the computer (with an imposed 10 minute limit) was reported as 8.5 minutes for the higher functioning group and 3.6 minutes for the lower-functioning group. Lower-functioning children were never observed using the computer without assistance, however, the amount of adult aid decreased over time, and peer aid increased over time for this group. Children in the higher functioning group used the computer independently 62% of the time by the last five weeks of the study. The authors state that the top choices of software were all user-controlled software as opposed to drill and practice.

Summary

Each of the five studies reviewed above examined the use of educational software with preschoolers with disabilities. Single-subject designs (Spiegel-McGill et al., 1989) and two correlational designs (Lehrer et al., 1986; O'Conner & Schery, 1986) were used. Two studies were identified as "exploratory" (Fazio & Reith, 1986; McCormick, 1987) with no experimental designs identified. In the four studies which compared a microcomputer software condition with another type of instructional condition (Lehrer et al., 1986; McCormick, 1987; O'Connor and Schery, 1986; Spiegel-McGill, Zippiroli, and Mistrett, 1989), results were inconsistent regarding the effect of the specified conditions on dependent measures. Therefore, it was difficult to draw general conclusions about the effectiveness of computer software with young children with disabilities.

Methodological Limitations

None of the studies examined the effects of specific characteristics of software programs. This fact may be the result of the difficulty in isolating the different variables existing from one software program to the other. For example, several studies compared the difference between play conditions and the effects on the social behaviors and cognitive development of the children targeted in the studies. Unfortunately, no meaningful comparison could be made because the dimensions inherent in the conditions were so different. Additional limitations that weakened the results of these studies involved the use of inconsistent operational definitions and a lack of valid measures.

Implications for Research

Given the limited number of studies available, as well as the methodological limitations of these studies, additional research is needed to evaluate the effectiveness of software on the cognitive, language, social, and motor development of young children with disabilities. Initially, research is needed that relates to software characteristics (e.g., animation, subject-matter, problem-solving capabilities, level of difficulty, user options) and subsequent effects on important dimensions of learning. A further concern that researchers can address involves separating the effects of specific adult cues/teaching strategies from the effects of the software.

Finally, a large gap exists between the technology used in research and the technology available for use in educational contexts. The next generation of research should invesfigate the effects of present and emerging technology (e.g. augmentative communication devices, talking books on CD Rom, interactive video programs, drawing and music software) on the acquisition and generalization of skills and opportunities for inclusion.

CONCLUSION

This paper provided a review of the literature involving the use of technological interventions with children who have disabilities from birth to age five. This review indicates that there is a paucity of existing research in this area. The studies that are available fall into two categories: adapted switch toys and microcomputer software. The effectiveness of adapted switch toys as contingent reinforcers has been demonstrated by four studies. Methodological limitations of existing studies, however, limit the generality of these findings. Studies which examined the effectiveness of microcomputer software also demonstrate inconsistent results. Obviously, considerable research is needed to determine all the effects that technological interventions have on the growth and development of infants and preschoolers with disabilities.

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Infant-Toddler Intervention
7(3), 141-160

Assessing Infant Environments

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Quality of care may have considerable impact on an infant's developmental outcomes. Research to date suggests effects of early extensive infant care extend into childhood. Degree and nature of interactions between infants and their caregivers appear to affect children's development. The purpose of this study was twofold: (a) investigate the construct validity of Caregiver-Environment scale (this is a "working" title for this scale as of this writing), an instrument designed to assess infant daycare center environments, play materials, and infant-caregiver interactions, by examining evidence of convergent and discriminant validity, through a multitrait-multimethod matrix; and (b) investigate content validity of Caregiver-Environment through a content validity ratio. In the multitrait-multimethod design, three traits (i.e., caregiver interaction, play materials and environmental conditions) were assessed by three methods (administrator, parent, and center based infant caregiver). A sample of 25 infant care centers participated. Results indicate evidence of construct validity when administrators and caregivers were employed as methods using Caregiver-Environment to measure infant care facilities. There also appeared to be systematic error associated with the use of Caregiver-Environment by administrators and parents that diminished evidence of construct validity. Overall, items on Caregiver-Environment were identified by administrators, parents, and caregivers as essential components of a quality infant care center.

At birth, infants appear to possess the ability to participate in social interactive play when adults respond appropriately to their signals (Bowlby, 1969; Trevarthen, 1974). It appears that interactive play serves to organize multiple developmental lines and as such serves a critical adaptive function: it helps a child to assimilate and gain mastery in all areas of development (Nover, 1985). Early social interactive play has been linked to emotional, social, and communication development in infants Whaley, 1990).

Reciprocity of early communicative intent during play is more likely to allow an infant to develop an internal model of one's self as a valued, self-reliant person (Bowlby, 1969), thus contributing to healthy emotional development. For example, it has been demonstrated that a mother's responsiveness to infant signals during interactive play results in more secure emotional attachment classifications at 12 months of age (Ainsworth, Bell, & Slayton, 1974). Further evidence suggests that that secure attachments at 12 to 18 months of age allow for the transition to peer play and further development of social skills Whaley, 1990).

Many rules of social interaction are learned and practiced through early caregiver-infant interactive play (Whaley, 1990). These rules, including mutual involvement, turn taking, role repetition, and nonliterality, are inherent in early caregiver-infant games (Bruner & Sherwood, 1976). Contingent responsiveness, a critical component of mutual responsiveness, which occurs in early caregiver-infant social interactions, is a key to play and learning (Bailey & Wolery, 1992; Caruso, 1988).

Infant behaviors serve successful communicative functions when caregivers interpret and respond appropriately to infant cues, thus, caregiver interactive style influences ongoing language and communication development (Mahoney, 1988). Caregiver reciprocity to infant cues is the foundation for expressive communication and an infant's emerging language system (Mclean, 1990). In later infancy, communicative reciprocity allows infants to form and test hypotheses about behavior related to outcomes in play interactions (Bailey & Wolery, 1992).

In consideration of the importance of early social interactive play, the role of the caregiver

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in this interaction has received much attention. Indeed, caregiver interactions in children's play or the various forms of play training may enhance the practice or learning benefits children get from play. Vygotsky (1978) describes the importance of the "zone of proximal development" (ZPD) in understanding how children enter into the social and cultural world. The ZPD is the difference between what a child can achieve unaided and what he or she can do with the aid of a more experienced person. This argument has been further developed by Wood, Bruner, and Ross (1976) using the metaphor of "scaffolding." Through scaffolding, a more experienced person can help a child, for example, by pointing out salient features of a task, breaking the task into smaller components, or helping with sequencing.

If operating within the ZPD or by scaffolding slightly more difficult play, the adult can help a child learn more and play at a more complex level (Smith, 1992). Thus, the nature of play experience provided by a caregiver is critical for an infant's total development (Nover, 1985). Through reciprocity in play, the caregiver communicates the degree to which the infant may have an impact on his or her surroundings and the quality of that impact.

To guarantee optimal development through interactive play, it is necessary to examine the total environment in which infants spend their days. Over the course of two decades, as a result of the rise in number of dual-parent employment and single-parent families, infant care environments have increasingly moved from the home into nonfamilial settings (Neugebauer, 1992). Infant care out of the home presents an interesting situation, in that the infant may be cared for by an adult with no emotional ties to the infant. This situation and other out-of-home care considerations have fueled protracted debate about the effects of nonfamilial care on children's development (Belsky, 1988; Clarke-Stewart, 1989; Lamb & Sternberg, 1990). Yet, nonfamilial infant care is not a homogeneous entity, but rather a complex experience influenced by myriad variables.

Early interactive play may be affected by family, child, and program variables, all of which play roles in moderating effects of infant care on infant development. As infants are increasingly placed in nonfamilial settings, program practices appear to be a critical variable of any long-term effects associated with center-based infant care (Dunn, 1993; Phillips, Voran, Kisker, Howes, & Whitebook, 1994; Vandell & Corasaniti, 1990; Zaslow, 1991). Although important variables have been identified, critical variables appear to be milieu characteristics of a center (Dunn, 1993) and ongoing training of caregivers (Arnett, 1989; Dunn, 1993; Jacobson & Owen, 1987; Powell & Stremmel, 1989; Zaslow, 1991). Milieu factors (i.e., structural and environmental indicators) such as play materials, furniture, and physical space are not difficult to assess or redesign. The caliber of caregivers' preparedness to serve to stimulate (i.e., process quality indicator) growth, however, is much more difficult to ascertain. Child caregivers in centers have a wide range of credentials and experiences. Their training needs are difficult to identify and appropriate training is difficult to plan (Arnett, 1989; Powell & Stremmel, 1989). Interactions between caregiver and infant that accompany play may be the critical variable in determining impact of center-based infant care.

Characteristics of care may have considerable impact on an infant's developmental outcomes. In light of the importance of all three indicators (i.e., structural, environmental, process) to optimal development of a child and the challenge of accurately assessing all three indicators, what is needed is an instrument that can be used to assess quality of child care programs and be used to plan appropriate training, pertinent to center-based needs. *Caregiver-Environment* (Capone, Oren, & Neisworth, 1995) has been developed to address this need.

The purpose of the study detailed here was to investigate the construct validity of *Caregiver-Environment*, an instrument that assesses three categories of characteristics of infant daycare-center environments, play materials, and caregiver-infant interactions-by examining evidence of convergent and discriminant validity. In this study, multitrait-multimethod analysis

(Campbell & Fiske, 1959) provided estimates of convergent and discriminant validity through a systematic correlation matrix employing three traits and three methods.

Methodology

Instrument and Observer's Manual Development

To identify specific content for inclusion in *Caregiver-Environment*, several steps were taken. First, based on the theory that infant development scales should reflect what is currently accepted as normal infant development, infant development scales were reviewed. These scales were reviewed to identify congruence across scales, identifying times for infants' acquisition of behaviors and skills, and extrapolate caregiver behaviors that may be significant at the acquisition times. Next, an extensive review of the professional literature in the areas of mother-infant interactions, infant development, and play training was conducted to further identify process and environmental variables shown to be correlated with optimal infant development. Last, existing instruments that assess variables associated with early childhood care were reviewed. These included *Infant/Toddler Environmental Rating Scale* (Harms, Cryer, & Clifford, 1990), *Early Childhood Teacher Observation Checklist* (Briggs, 1987), National Association for the Education of Young Children recommended practices (Bredekamp, 1984), Caregiver Interaction Scale (Arnett, 1989, *Early Childhood Environmental Rating Scale* (Harms & Clifford, 1980), and Division for Early Childhood recommended practices (Division for Early Childhood/Council for Exceptional Children, 1993). *Caregiver-Environment* differs from these instruments in that the focus of *Caregiver-Environment* is on specific caregiver interactive behaviors with infants from 6 weeks to 1 year old (see Table 1), as well as the identification of environmental characteristics and materials in infant care centers. Additionally, examples of caregiver behaviors that correspond to each caregiver item assessed on *Caregiver-Environment* are provided for further clarification.

Recommended practice variables were systematically organized into three categories: caregiver-infant interactions, play materials, and environmental features. These three categories (i.e., caregiver-infant interactions, materials, environment) of recommended practice indicators were used to form the three sections of the *Caregiver-Environment: Section I, Caregiver-Infant Interaction, Section II, Play Materials, and Section III, Environmental Characteristics.*

An *Observer's Manual* was designed to provide raters with specific examples of each of the caregiver behaviors that were assessed in Section I, Caregiver Activities that Foster the Development of Infant-Caregiver Interactions. The *Observer's Manual* was developed to provide item clarity and provide functional descriptions of each of the 29 items in Section I. Table 2 provides an example of item 1 in the *Observer's Manual* that would correspond to item 1 in Section I (i.e., item 1 in Section I is described in Table 1). Items in Sections II or III were not covered in the Observer's Manual because these items are specific, discrete (e.g., ball, rattle, carpeted floor), and self-explanatory.

Caregiver-Environment was designed to be completed by individuals affiliated with a specific center. In this study, *Caregiver-Environment* was completed by directors, teachers (caregivers), and parents. Each individual completes the three sections based on personal observations and recall using the 4-point Likert type scale (i.e., 1 lowest, 4 highest) to identify specific caregiver behaviors, environmental features, and play materials that the observer has seen. All necessary information to complete the probe, including *the Observer's Manual*, is included in a *Caregiver-Environment* packet. Although the *Observer's Manual* was available to all participants, it is not known to what extent it was used by groups completing the instrument.

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Table 1. Examples of Items from Caregiver-Environment Section I

6 Weeks to 12 Months

The Caregiver

1. Imitates infant's sounds, adding inflections and encourages the infant to repeat the sound.
3. Describes what is occurring during routines (diapering, bathing, feeding).
11. Talks about what the infant is exploring without being distracting.

6 Months to 12 Months

The Caregiver

1. Provides activities that allow the infant to explore various surface textures (sticky tape, water, waxed paper, etc.).
6. Fosters independence by encouraging infant to pull off socks, use a cup, use a spoon, etc.
7. Reads, sings and repeats rhymes with infant.

Table 2. Example of Item 1 from Observer's Manual Corresponding to Item 1 in Section I

6 Weeks to 12 Months

1. Imitate infant's sounds, adding inflections and encourages infant to repeat the sound

DO

- React promptly to infant's sound
- "Make faces" and gestures/encourages eye contact
- Use a variety of intonations or inflections such as happy
- Show enjoyment while imitating infant's sounds
- Repeat mouth actions such as lip popping
- Exaggerate facial and mouth movements to keep infant's attention. Play "I'm Going to Get You" or tickle the infant. Repeat infant's sounds.
- Sing simple nursery rhymes and songs that contain simple movements that are related to specific words.

DON'T interrupt infant who is making happy babbling sounds

Identification and Selection of Infant Care Centers

Thirty-one randomly selected state licensed centers providing care to infants agreed to participate in the study with, 25 centers located in Pennsylvania and 6 centers located in Alaska, Idaho, Missouri, Florida, Delaware, or Indiana. All centers were assessed by three different raters on all items of the three sections of *Caregiver-Environment* as well as the "essentialness" of each item. All completed *Caregiver-Environment* protocols were coded to enable differentiations among centers, but each source remains anonymous, ensuring confidentiality of programs and individuals. Centers in the study were denoted by a number. Raters in each facility were denoted as A (i.e., administrator), P (i.e., parent) and C (i.e., caregiver). Thus, for center 1, raters were denoted as 1A, 1P, and 1C. Center directors disseminated *Caregiver-Environment* protocols to the caregiver and parent participating in the study. Each rater was provided a postage-paid return envelope in which to return protocols to the principal investigator.

Two main data analysis procedures were used in this study. Multitrait-multimethod analysis was used to determine convergent and discriminant validity of *Caregiver-Environment*. A content validity ratio (Lawshe, 1975) was used to' determine content validity of the instrument. Explanations of these procedures as they pertain to this particular study follow. In addition, Chronbach Alpha was used to estimate a reliability index.

Multitrait-Multimethod (MTMM) Description

Campbell and Fiske (1959) have systematically discussed the premise of validation process as encompassing four main points. First, validation is convergent. Degree of convergent validity is evidenced by the magnitude of the correlation between two measures independent of each other measuring the same trait. Two different but valid measures of the same trait will yield similar results. Second, discriminant validation is also necessary. Discriminant validity is demonstrated by the lack of correlation between the scale of interest and an irrelevant trait measured by the same or different method. The measure of the trait should assess that trait independently of other traits. Third, each method employed for measurement purposes is a trait-method unit. Systematic variance among method test scores may be due to the methods used as well as responses to trait content. Last, to establish discriminant validity, more than one trait as well as more than one method must be employed. This is best viewed in a multitrait-multimethod (MTMM) matrix format where all intercorrelations resulting from several traits measured by each of several methods is presented (see Table 3).

In the present study, three different traits (i.e. "i" denoting interaction of caregiver-infant, "e" denoting environmental conditions, and "m" denoting play materials) were measured by three different methods (i.e., "A" denoting Administrator, "P" denoting Parent, and "C" denoting Caregiver). Discussion on the components of the matrix, as the matrix relates to this study, will follow. Table 4 displays the matrix as it applies to this study.

In this study, reliabilities are referred to as reliability diagonals or monotrait-monomethod values. On accompanying Table 4, there is a reliability for each method-trait unit. Reliabilities are designated as the values in parentheses (i.e., iAiA, eAeA ... eCeC, mCmC) in Table 4. Next to each reliability diagonal is the heterotrait-monomethod triangle enclosed in a bold line. Values in the heterotrait-monomethod triangles provide evidence of discriminant validity. Within the heterotrait-monomethod triangle, correlations are derived between traits using the same method. Examples would be the correlation between caregiver-infant interaction (i) and environmental conditions (e) as measured by an administrator (A), noted as "iAeA" or the correlation between environmental (e) conditions and play materials (m) as measured by a caregiver (C), noted as "eCmC." The reliability diagonal and adjacent heterotrait-monomethod triangle make up the monomethod block.

The validity diagonal is designated by monotrait-heteromethod values. Validity diagonals, values associated with convergent validity, are the three sets of values in **bold text**. An example from each of the three sets would be "**eAeP**," "**mPmC**," and "**iAiC**." The validity diagonal provides correlations between the same traits as measured by different methods. Thus, "**eAeP**," as noted above, would be the correlation established when two different methods (i.e., administrator [A] and parent [P]) rate the environmental conditions (e) trait.

Last, on each side of the three sets of validity diagonals are two sets of heterotrait-heteromethod triangles. Values within heterotrait-heteromethod help to establish discriminant validity. Within the heterotrait-heteromethod triangle, different methods are correlated with different traits. An example would be "eAiP," in which a correlation is established between administrators' (i.e., method "A") assessment of environmental conditions (i.e., trait "e") and parents' (i.e., method "P") assessment of caregiver-infant interactions (i.e., trait "I"). A validity diagonal

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Table 3. Organization of Correlations

		Method 1			Method 2			Method 3		
	Trait	X	Y	Z	X	Y	Z	X	Y	Z
Method 1	X	(r)								
	Y	dv1	(r)							
	Z	dv1	dv1	(r)						
Method 2	X	cv	dv2	dv2	(r)					
	Y	dv2	cv	dv2	dv1	(r)				
	Z	dv2	dv2	cv	dv1	dv1	(r)			
Method 3	X	cv	dv2	dv2	cv	dv2	dv2	(r)		
	Y	dv2	cv	dv2	dv2	cv	dv2	dv1	(r)	
	Z	dv2	dv2	cv	dv2	dv2	cv	dv1	dv1	(r)

Table 4. MTMM Matrix for Present Study

		Method A (Administrator Evaluation)			Method P (Parent Evaluation)			Method C (Caregiver Evaluation)		
	Trait	iA interact	eA environ	mA materials	iP interact	eP environ	mP materials	iC interact	eC environ	mC materials
Method A (Administrator Evaluation)	iA interact	(iAiA)								
	eA environ	iAeA	(eAeA)							
	mA materials	iAmA	eAmA	(mAmA)						
Method P (Parent Evaluation)	iP interact	iAiP	eAiP	mAiP	(iPiP)					
	eP environ	iAeP	eAeP	mAeP	iPeP	(ePeP)				
	mP materials	iAmP	eAmP	mAmP	iPmP	ePmP	(mPmP)			
Method C (Caregiver Evaluation)	iC interact	iAiC	eAiC	mAiC	iPiC	ePiC	mPiC	(iCiC)		
	eC environ	iAeC	eAeC	mAeC	iPeC	ePeC	mPeC	iCeC	(eCeC)	
	mC materials	iAmC	eAmC	mAmC	iPmC	ePmC	mPmC	iCmC	eCmC	(mCmC)

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and the two sets of heterotrait-heteromethod triangles on each side of the validity diagonal form a heteromethod block.

Content Validity Ratio

Administrators, parents, and caregivers participating in the study were asked to respond to the following statement for each item on *Caregiver-Environment*:

Based on your judgment of a quality program, check one of the columns below.

-Essential item
-Useful, but not essential
-Not necessary

Quantifying consensus of judgments of a quality program were based on two principles established by Lawshe (1975) (a) any item that was perceived to be "essential" by more than half of the respondents had som degree of content validity; and (b) the more respondents, beyond 50% who perceived an item as "essential," the greater the degree of content validity. Content validity was established through a content validity ratio (CVR) (Lawshe, 1975) as:

$$CVR = \frac{n(e) - N/2}{N/2},$$

where n(e) is the number of respondents indicating "essential" and N is the total number of respondents.

Results

In Table 5, descriptive statistics of the sample distribution of three traits (i.e., interaction, materials, environment) paired with three methods (i.e., administrator, parent, caregiver) over 25 infant care centers are presented.
Intercorrelations of the three traits by three methods are presented in Table 6 in the form of a MTMM matrix. Correlation coefficients in bold represent convergent validity values of the same trait across methods of measurement; correlation coefficients within solid line triangles represent heterotrait-monomethod values or the effects of measurement bias across different traits; and, the correlation coefficients enclosed on each side of the validity diagonal represent heterotrait-heteromethod values or the

Table 5. Descriptive Statistics for 25 Cases

	iA	**mA**	**eA**	**iP**	**mP**	**eP**	**iC**	**mC**	**eC**
Minimum	76.00	51.00	35.00	78.00	68.00	39.00	90.00	61.00	44.00
Maximum	116.00	92.00	59.00	116.00	96.00	60.00	116.00	95.00	56.00
Range	40.00	41.00	24.00	38.00	28.00	21.00	26.00	34.00	12.00
Mean	104.00	77.88	51.80	102.92	84.52	50.92	104.20	78.68	51.32
Variance	106.83	105.44	31.66	113.07	76.96	31.16	53.58	102.31	14.06
SD	10.33	10.27	5.62	10.63	8.77	5.82	7.32	10.21	3.75
SE	2.06	2.05	1.12	2.13	1.75	1.12	1.46	2.02	0.75
Skewness	−1.03	−1.15	−1.15	−0.78	−0.84	−0.34	−0.19	−1.06	−0.55

Note: i = interaction, m = materials, e = environment, A = administrator, P = parent, C = caretaker.

Table 6. Multitrait-Multimethod Matrix (MTMM)

		Method A (Administrator Evaluation)			Method P (Parent Evaluation)			Method C (Caregiver Evaluation)		
	Trait	iA Interact	eA Environ	mA Materials	iP Interact	eP Environ	mP Materials	iC Interact	eC Environ	mC Materials
Method A (Administrator Evaluation)	iA Interact	(.89)								
	eA Environ	.267	(.65)							
	mA Materials	.534	.587	(.77)						
Method P (Parent Evaluation)	iP Interact	.328	.338	.303	(.91)					
	eP Environ	.532	.116	.216	.248	(.62)				
	mP Materials	.084	.185	.360	.507	.399	(.81)			
Method C (Caregiver Evaluation)	iC Interact	.621	.060	.377	.285	.177	.076	(.85)		
	eC Environ	.172	.667	.450	.343	-.072	-.028	-.046	(.43)	
	mC Materials	.153	.211	.577	.340	.084	.486	.385	.361	(.82)

degree of discriminant validity between different methods measuring different traits. Reliability figures are denoted in parentheses.

Convergent validity was evidenced when the following statements held true.

1. The correlation coefficient for the trait of caregiver-infant interaction across methods of measurement will be statistically ($p <. 05$) different from zero.
2. The correlation coefficient for the trait environment across methods of measurement will be statistically ($p <.05$) different from zero.
3. The correlation coefficient for the trait materials across methods of measurement will be statistically ($p <.05$) different from zero.

The results of an analysis of the MTMM matrix did not support statement 1. Only one of three correlation coefficients, administrator-interaction and caregiver-interaction, 0.621, met the $p <.05$ standard. Using Fisher's r to Z transformation, the average convergent validity coefficient was 0.485 for measures of the trait, interaction.

Statement 2 was not supported by results indicated through analysis of the MTMM matrix. Only the correlation between administrator-environment and caregiver-environment, 0.667, met the statistical significance level ($p<.05$) established. The average convergent validity coefficient was 0.343 for measures of the trait, environment, using Fisher's r to Z transformation.

Results supported statement 3, in that all methods assessing the trait, materials, met the established statistical significance level ($p<.05$). Correlation between administrator-materials and caregiver-materials was 0.577, between parent-materials and caregiver-

Table 7. Criterion Tests for Matrix Data

Validity coefficients		**Heterotrait-heteromethod**				**Heterotrait-monomethod**			
		A. Criterion for Hypothesis 4							
iAiP	**.33**	.34*	.30	.53*	.08	.27	.53*	.29	.50*
eAeP	**.12**	.39*	.19*	.53*	.22*	.27*	.59*	.29*	.40*
mAmP	**.36**	.30	.22	.08	.19	.53*	.59*	.51*	.40*
iAiC	**.62**	.06	.38	.17	.15	.27	.53	−.46	.39
eAeC	**.67**	.06	.21	.17	.45	.27	.59	−.46	.36
mAmC	**.58**	.38	.45	.15	.21	.53	.59*	.39	.36
iPiC	**.29**	.18	.08	.34*	.34*	.25	.51*	−.46	.36*
ePeC	**−.72**	.18*	.08*	.34*	−.03*	.25*	.40*	.39*	.36*
mPmC	**.41**	.08	−.03	.34	.08	.51*	.40	.39	.36

B. Hypothesis 5

Triangle	Order	Trait pattern
A-A (solid line)	eAmA >iAmA >iAeA	em >im >ie
P-P (solid line)	iPmP >ePmP >iPeP	im >em >ie
C-C (solid line)	CmC >eCmC >iCeC	im >em >ie
A-P top (dashes)	iPeA >iPmA >ePmA	ie >im >em
A-P bottom (dashes)	iAeP >eAmP >iAmP	ie >em >im
A-C top (dashes)	eCmA >iCmA >iCeA	em >im >ie
A-C bottom (dashes)	eAmC >iAeC >iAmC	em >ie >im
P-C top (dashes)	iCeP >iCmP >eCmP	ie >im >em
P-C bottom (dashes)	iPeC >iPmC >ePmC	ie >im> em

* correlation larger than validity coefficient

materials was 0.406, and between administrator-materials and parent-materials was 0.360. The average convergent validity coefficient was 0.533 for measures of the trait, materials, using Fisher's r to Z transformation.

Overall, 5 of 9 convergent validity coefficients were statistically different from zero and sufficiently large to continue further examination of validity. Convergent validity was supported for the trait, materials, across methods. In addition, all coefficients within the administrator-caregiver block support convergent validity.

Discriminant validity is addressed by statement 4.

4. Monotrait-heteromethod correlation coefficients will exceed heterotrait-monomethod and heterotrait-heteromethod correlation coefficients.

Table 7 presents criterion test data for statement 4. A variable should correlate higher with an independent measure of the same trait (i.e., monotrait heteromethod) that with different traits that employ the same method (i.e., heterotrait-monomethod). This essential requirement for discriminant validity involves comparing convergent validity values (i.e.,monotrait-heteromethod) with its values in the columns and rows of solid line heterotrait-monomethod triangles. Each convergent validity (i.e.,monotrait-heteromethod) value was compared with four corresponding heterotrait-monomethod values. The nine convergent validity values accounted for a total of 36 comparisons. Convergent validity values exceeded heterotrait-monomethod values in 18 of 36 comparisons. Convergent validity values exceeded corresponding heterotrait-monomethod values in 2 of 12 instances within the Administrator-Parent validity diagonal, 5 of 12 instances within the parent-caregiver validity diagonal, and 11 of 12 instances within the administrator-caregiver validity diagonal.

Overall, only the administrator-caregiver validity diagonal provided support for discriminant validity. Contrarily, in no instances, within administrator-parent validity diagonal and parent-caregiver validity diagonal, did the trait, environment, have convergent validity values exceeding corresponding heterotrait-monomethod values.

Monotrait-heteromethod validity values (i.e.,convergent validity values) should also be uniformly higher than heterotrait-heteromethod values (discriminant validity values) lying in its column and row of the heterotrait-heteromethod triangles (i.e., dotted triangles). A trait measured by different methods (i.e., monotrait-heteromethod) should have a higher value than correlations of variables having neither trait or method in common (i.e., heterotrait-heteromethod). This desideratum requires each of the 9 convergent validity values be compared to 4 corresponding heterotrait-heteromethod) values, for a total of 36 comparisons. Convergent validity values exceeded corresponding heterotrait-heteromethod values in 24 of 36 comparisons. All convergent validity values within the administrator-caregiver block exceeded corresponding heterotrait-heteromethod values. Convergent validity values exceeded heterotrait-heteromethod values in 7 of 12 comparisons in the administrator-parent block and 6 of 12 comparisons in the parent-caregiver block. In no instances did the trait, environment, in the administrator-parent validity diagonal or parent-caregiver validity diagonal exceed corresponding heterotrait-heteromethod values.

A final requirement for construct validity is stated in statement 5.

5. The pattern of trait interrelationships will be the same in all heterotrait triangles of both the monomethod and heteromethod blocks.

Regardless of methods used, the same pattern of the rank order magnitude of correlations should be evidences within each triangle. This pattern of correlations should reflect the various causal connections among the traits interaction (i), environment (e), and materials (m). Table 7 identifies correlational orders in all monomethod and heteromethod triangles. Examination of the order of correlations suggests no causal connections among traits. There was no order of correlations that occurred more than three times. The following orders were present: ie>im>em (thrice), im>em>ie (twice), ie>em>im (once), em>ie>im (once).

Last, content validity ratios in all three sections of *Caregiver-Environment* will be statistically ($p<.05$) different from zero. The following points, extrapolated from Lawshe (1975), were used as guides while examining the results of the content validity ratio (CVR) scores. First, when fewer than half of the respondents said "essential," the CVR is negative. Second, when half of the respondents said "essential" and half did not, the CVR is zero. In addition, when all respondents said "essential," the CVR is adjusted to 0.99. Finally, when the number of respondents saying "essential" was more than half, but less than all respondents, the CVR was between zero and 0.99.

The total CVR for all items *on Caregiver Environment*, across all administrators, parents, and caregivers was 0.58 ($p<.05$). Mean CVR's for each of the three major sections of *Caregiver-Environment* are as follows: Caregiver-Infant Interaction (Section I) 0.68 ($p<.05$), Materials (Section II) 0.41 ($p<.05$), Environment (Section III) 0.62 ($p<.05$). Table 8 provides mean CVR scores for each item on *Caregiver Environment* across all administrators, parents, and caregivers, as well as total mean scores of age level components within each of the three sections of *Caregiver-Environment*.

The content validity ratio value (CVR) computed for each item on *Caregiver-Environment* was then used to eliminate those items in which concurrence of raters might reasonably have occurred through chance ($p < .05$). The remaining items retained on the test made up the content validity index (CVI). The CVI is the mean of the CVR values of retained items.

The CVI for *Caregiver-Environment* was computed to .70 after deletion of 13 of 68 items that did not meet statistical significance. Only 1 of 29 items in Section I, caregiver behavior, failed to meet statistical significance levels. The majority of items not meeting statistical significance were located in the 6-month to 12-month component of Section II, Materials, where only 5 of items met criteria for retention of item.

Discussion

Construct Validity

The intent of Campbell and Fiske (1959) in the development of the MTMM matrix was to provide researchers with a heuristic structure for the formative evaluation of data at the individual trait-method unit. Campbell and Fiske argued for use as a formative evaluation tool, careful examination of the matrix will provide the researcher information on subsequent courses of action: which methods should be replaced or discarded, which concepts/traits need sharper delineation, and which traits are poorly measured because of excessive or shared method effects.

Results from this investigation reveal that the method "parent" may be a measure that should be revised. Under the conditions of this study, parents were unable to discriminate between traits and there appeared to be systematic error with this method that affected correlations. This may have been a result of parents not having had as much training as caregivers and administrators in recommended caregiving practices. Although examples of recommended caregiving practices were provided in the *Observer's Manual*, it is unknown whether parents were provided the manual by administrators or whether it was referred to while filling out *Caregiver-Environment*. For these reasons, training and practice in use of *Caregiver-Environment* and the *Observer's Manual*, by parents, may reduce the effects of systematic error that appeared in this method and may provide a better estimate of convergence between methods. Convergent validation is important with this method, if parents are to use *Caregiver-Environment* in rating infant care centers.

It appears traits selected for this study may be intercorrelated. The traits of materials and environment may be part of the same trait structure and not distinct traits. There also appears to be a casual relationship between interaction and the other traits noted in the monomethod and heteromethod triangles, possibly inflating correlational values beyond that of method effects alone. These results may provide confirmation of previous studies (Vandell, Henderson, & Wilson, 1988) that surmised intercorrelations; among the traits employed in this study.

Method effects appear to be unbridled in the administrator and parent methods, making it difficult to independently measure traits in this study. In future research, it may not be necessary to discard these methods, but steps would need to be taken to diminish effects of systematic error. Inservice training in identifying recommended practices and controlled practice in use of *Caregiver-Environment* may help in this respect.

Lack of strong evidence for either convergent or discriminant validity, as in this study, is not usual in MTMM analysis research. Few studies in the literature approach conclusive support for convergent and discriminant validity through this method. This occurs because traits are not distinct or the ubiquitous nature of method effect. However, within this study, the minimatrix encompassing the administrator and caregiver methods met the criteria conceived by Campbell and Fiske (1959) and established as hypotheses for this study, for both convergent and discriminant validity. As construct validity is the

Table 8. Content Validity Ratio

CHECKLIST #1
EMPHASIS CAREGIVER PRACTICES THAT ENCOURAGE INFANT PLAY

	Content Validity Ratio			
	Admin	**Parent**	**Care-giver**	**Total**
6 Weeks to 1 Year				
The Caregiver:				
1. Imitates infant's sounds, adding inflections and encourage the infant to repeat the sound.	.92	.99	.83	.92
2. Tells infant what is about to happen.	.67	.65	.74	.69
3. Describes what is occurring during routines (diapering, bathing, feeding).	.58	.65	.74	.66
4. Reacts to infant's signals (e.g., eye contact, widening eyes, waving arms, and reaching).	.83	.91	.99	.92
5. Provides the infant opportunity to explore different textures.	.42	.56	.65	.54
6. Places infant in different positions for play and also in different locations in the room.	.99	.65	.99	.89
7. Encourages infant to look at brightly colored objects as objects are moved.	.76	.56	.91	.74
8. Plays simple movement/singing games with infant.	.92	.83	.91	.89
9. Provides opportunities for infant to reach for, pull, and grasp playthings.	.99	.91	.99	.97
10. Provides variety of sounds for infant to attend to.	.67	.39	.74	.62
11. Talks about what the infant is exploring without being distracting.	.67	.30	.48	.49
12. Shows interest in sounds that infant is making and repeat them for infant.	.83	.74	.99	.86
13. Includes infant in conversation and identify people and actions that are taking place.	.50	.74	.83	.69
14. Encourages language development by asking older infant questions or giving simple commands.	.75	.83	.91	.83
MEAN (6 weeks–6 months)	**.70**	**.69**	**.84**	**.74**

	Content Validity Ratio			
	Admin	**Parent**	**Care-giver**	**Total**
6 to 12 Months				
The Caregiver:				
1. Provides activities that allow the infant to explore various surface textures (sticky tape, water, waxed paper, etc.).	.17	.13	−.04	.09
2. Places infant in front of mirrors with toys to enable them to watch themselves play.	.58	.22	.65	.49
3. Changes the infant's position so a different perspective of the toy is seen.	.50	.39	.56	.49
4. Places toys and other materials in a way that infants need to "reach" to get to them.	.92	.65	.91	.82
5. Provides opportunities for infant to develop balance and movement skills.	.92	.91	.99	.94
6. Fosters independence by encouraging infant to pull off socks, use a cup, use a spoon, etc.	.83	.74	.83	.80
7. Read, sings, and repeats rhymes with infant.	.92	.74	.99	.89
8. Provides opportunities for infant to find objects that are hidden under blankets, bowls, etc.	.42	.22	.45	.36
9. Provides opportunities for infant to experience moving through space.	.25	.39	.45	.36
10. Activities that allow infant to throw/drop objects.	.58	.48	.65	.59
11. Encourages the infant to stack, unwrap, and transfer objects in and out of containers.	.83	.56	.99	.80
12. Provides objects that make sounds through a variety of actions by the infant.	.75	.48	.74	.66
13. Provides opportunities for infant to play with objects that work together (dump truck and sand, comb and brush, spoon and bowl).	.58	.13	.45	.39
14. Encourages infant to use imitative actions of caregiver.	.58	.39	.82	.59
15. Provides opportunities for infant to see how actions have cause and effect.	.50	.74	.65	.63
MEAN (6 months–12 months)	**.62**	**.49**	**.67**	**.59**

TOTAL MEAN/INTERACTION (6 weeks–12 months) = .67

(continued)

Table 8. *(continued)*

CHECKLIST #2
TOYS AND MATERIALS THAT ENCOURAGE INFANT PLAY

	Content Validity Ratio			
	Admin	**Parent**	**Care-giver**	**Total**
6 Weeks to 3 Months				
For infants in the birth to 3 month age range toys should: Be bright and colorful: *to encourage the infant to reach out and grab.* Provide interesting shapes and objects to look at: *to attract and hold the infant's attention.* Be musical: *toys that play music or jingle or shake are a double delight.*				
For infants 6 weeks to 3 months of age, the following toys are available when needed:				
1. Mobiles with bright colors, interesting shapes, and sounds.	.56	.80	.83	.72
2. Rattles of different sizes, shapes, and textures.	.91	.90	.99	.94
3. Soft toys (e.g., soft balls, stuffed animals, squeeze toys).	.83	.80	.99	.88
4. Unbreakable mirrors.	.74	.90	.91	.85
TOTAL MEAN (6 weeks–3 months)	**.76**	**.85**	**.93**	**.84**
3 Months to 6 Months				
For infants in the 3 to 6 month age range toys should: Be bright and colorful: *to encourage the infant to reach out and grab.* Have texture: *a variety of textures reward the infant for exploring different objects.* Be responsive: *toys that respond with a shake or a jingle help infants discover that they are able to make things happen.*				
For infants 3 months to 6 months of age, the following materials are available when needed:				
1. Crib gyms.	.04	.27	.48	.26
2. Large plastic beads.	.30	.27	.56	.38
3. Plastic keys.	.56	.54.	.56	.68
4. Softballs of different textures.	.48	.82	.74	.68
5. Squeeze/squeaky toys.	.83	.82	.835	.83
6. Bells.	−.13	13	.30	.12
7. Measuring spoons.	−.30	−.45	−.50	−.41
8. Pull toys.	.30	.36	.48	.38
9. Mirrors (unbreakable).	.74	.82	.83	.79
TOTAL MEAN (3 months–6 months)	**.31**	**.40**	**.48**	**.40**

	Content Validity Ratio			
	Admin	**Parent**	**Care-giver**	**Total**
6 Months to 12 Months				
For infants 6 months to 12 months of age, the following toys are available when needed:				
1. Activity centers such as busy boxes with a variety of knobs, cranks, dials, doors, and sounds.	.65	.74	.74	.71
2. Roly-poly toys with weighted bottoms.	.30	.22	.30	.28
3. Balls of different sizes and textures, bean bags.	.48	.39	.83	.56
4. Nesting toys: for handling and manipulation.	.67	.56	.91	.69
5. Variety of paper to tear.	−.67	−.22	−.74	−.54
6. Boxes of all sizes with lids.	−.25	.13	−.09	−.07
7. Plastic or wooden cars and trucks.	.25	.22	.30	.26
8. Blocks: lightweight for throwing and stacking, heavy blocks for grasp and release.	.58	.65	.65	.63
9. Everyday objects that are safe: pots, pans, wooden spoons, unbreakable cups, and containers.	.42	.22	.13	.26
10. Water toys to allow infants to explore concepts of movement and motion.	.00	−.04	.00	−.01
11. Peg toys which bring together elements of sorting and concepts of in and out.	.08	.39	−.09	.13
TOTAL MEAN (6 months–12 months)	**.23**	**.30**	**.29**	**.27**

TOTAL MEAN/MATERIALS (6 weeks–12 months) = .41

(continued)

accumulation of evidence, these results do provide some measure of construct validity under conditions of the measure employing administrator and caregiver methods.

Content Validity

Content-related evidence is formulated through consensus of informed judgments about the relevance and representativeness of items on a test. In the present study, judgments as to the relevance of items depicting desirable characteristics of infant care programs were made by providers of the service (i.e.,caregivers and administrators) and stakeholders or users of the service (i.e., parents). The present study provides initial support for content validity of *Caregiver-Environment*. It was apparent from written feedback and CVR scores on the materials section that additional analysis of items is necessary to determine if items should be excluded from subsequent drafts of *Caregiver-Environment.*

Although use of CVR does not preclude use of other methods of item analysis or item discrimination procedures, the result from this study did identify items that administrators, parents, and caregivers agreed on as being essential components of a quality infant care center. It also posed questions as to whether the sample of items in the materials section were representative of the domain of interest. As a

Table 8. *(continued)*

CHECKLIST #3
ENVIRONMENTAL CHARACTERISTICS THAT ENCOURAGE PLAY

	Content Validity Ratio			
	Admin	**Parent**	**Care-giver**	**Total**
6 Weeks to 6 Months				
The Facility has:				
1. Cribs that allow infant to look out and around.	.99	.99	.83	.94
2. Walls that provide a variety of colors and shapes to look at.	.83	.82	.99	.88
3. Pictures that are at the infant's eye level.	.92	.62	.74	.76
4. Curtains that have bright colors and patterns.	.04	-.40	.64	-.30
5. A variety of sounds that occur throughou the day.	.92	.71	.45.	70
6. Crib sheets with bright patterns.	-.33	-.14	.27	-.25
7. Bright pillows.	-.65	-.42	.27	-.45
8. Rocking chairs for adults to rock babies.	.75	.72	.91	.79
9. An area of the room that is quiet and calming.	.83	.91	.72	.82
10. A space for infant to be protected from older children.	.83	.90	.83	.85
TOTAL MEAN (6 weeks–6 months)	**.51**	**.47**	**.43**	**.48**
6 to 12 Months				
The Facility has:				
1. Different levels to promote opportunities to crawl, creep, or climb,	.83	.72	.64	.74
2. Rails or small sturdy furniture that help the infant stand or cruise about.	.92	.99	.91	.94
3. The center of the room open and used as a hub for activities.	.99	.91	.99	.97
4. A combination of accessible storage and inaccessible storage areas to keep infant safe.	.92	.99	.91	.94
5. Areas of the room where the floor is carpeted or matted.	.99	.99	.91	.97
TOTAL MEAN (6 months–12 months)	**.93**	**.92**	**.87**	**.91**

TOTAL MEAN/MATERIALS (6 weeks–12 months) = .62

whole, items on *Caregiver-Environment* appear to be representative of items that a diverse group of individuals affiliated with infant care identity as being essential for quality infant care.

Research to date suggests the effect of early extensive infant care extend into childhood. The degree and type of interaction infants have with their caregivers appear to affect children's development. As the number of infants in center-based care continues to rise, there will be an increasing need for programs to have effective ways to train and monitor caregiver behaviors toward infants and monitor the milieu in which infants spend their days. The purpose of this study was twofold: (a) to investigate the construct validity of *Caregiver-Environment*, an instrument designed to assess infant daycare center environments, play materials, and infant-caregiver interactions, by examining evidence of convergent and discriminant validity through a MTMM matrix; and (b) to investigate content validity of *Caregiver-Environment* through a content validity ratio.

Results from this study indicate evidence of construct validity when administrators and caregivers were employed as methods using *Caregiver-Environment* to measure infant care facilities. There also appeared to be systematic error associated with the use of *Caregiver-Environment* by administration and parents throughout this study, which diminished evidence of construct validity. Overall, items on Caregiver-Environment were identified by administrators, parents, and caregivers as essential components of infant care center practices.

Consequently, *Caregiver-Environment* may be appropriately used by administrators and caregivers to formatively evaluate their practices against items in *Caregiver-Environment* deemed essential for quality programming. Additionally, administrators may want to investigate use of *Caregiver-Environment* as an initial training tool for new caregivers.

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From: Oren, T. and Ruhl, K.L., Assessing Infant Environments, *Infant-Toddler Intervention,* 7(3), 141, 1997.

Journal of Special Education Technology
13(3) 26-43

Family Issues and Assistive Technology Needs: A Sampling of State Practices

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In part as a result of federal legislation in the 1980s and 1990s, preschoolers with disabilities and their families increasingly have access to augmentative and alternative communication (AAC) devices. However, to date much is still to be learned about the degree to which various factors impact the many decisions inherent in prescribing AAC devices for these children. This survey of the 58 Part H coordinators throughout the nation queried respondents on services provided; factors considered during evaluation; the role of families in this process; and the consideration of the characteristics of the child, the technology, and the service system. The results are discussed in light of the necessity for sensitivity on the part of professionals to family issues.

Keywords: *Augmentative and alternative communication; assessment; early intervention; family-focused intervention; preschoolers with disabilities.*

Perhaps the most significant legal development in the movement to provide appropriate programs to preschoolers who have disabilities has been PL 99-457, the Education of the Handicapped Act Amendments of 1986. Among its most significant components were its mandates for (a) a family focus on interventions, and (b) family participation in planning and implementation of those interventions. This family-based orientation towards providing intervention services for young children who have disabilities was further emphasized in that laws reauthorization under P L 102-119, the *Individuals with Disabilities Education Act* of 1991 (IDEA).

Under this legislation, a multidisciplinary team develops an Individualized Family Service Plan (IFSP), a program designed to be responsive to the needs not just of the infant/toddler who has a disability, but to the larger set of needs of the entire *family* (Rosin, Whitehead, Tuchman, Jesien, & Begun, 1993). The clear philosophic intention of this legislation is for professionals to more completely include families in early intervention service delivery (McGonigel, Kaufmann, & Johnson, 1991; Rosin et al., 1993).

An increasingly frequent component of early intervention programs is the provision of assistive technology to young children with disabilities and their families (Behrmann, Jones, & Wilds, 1989; Parette & Brotherson, 1996; Parette, Hofmann, & VanBiervliet, 1994). Assistive technology devices are defined legally as "...any item, piece of equipment, or product system, whether acquired commercially, off the shelf, modified, or customized, that is used to increase, maintain, or improve the functional capabilities of children with disabilities" [P L. 102-119, 34 CFR §303.12(d)(1)].

The goal of assistive technology is to improve the functional capabilities of the child (Behrmann & Lahm, 1994; Church & Glennen, 1992; Developmental Disabilities Program, 1984; Garner & Campbell, 1987). Perhaps one of the most frequent goals for young children with disabilities is improvement in functional language capabilities (Behrmann et al., 1989; Butler, 1988). Thus, enhanced communicative skills are frequently emphasized in early intervention programs in the hope that it will facilitate the child's ability to more effectively function within integrated settings (Church & Glennen, 1992; Developmental Disabilities Program, 1984; Vanderheiden & Dolan, 1985).

Journal of Special Education Technology
13(3) 26-43

Given the primacy of enhanced communicative skills, one of the most powerful contributions assistive technology can offer is augmentative and/or alternative communication (AAC) systems to young children with disabilities (Beukelman & Mirenda, 1992; Parette, 1995; Parette, VanBierviiet, & Bradley, 1994). When funded through Part H of IDEA, proposals for AAC devices usually occur after a comprehensive assessment and evaluation by a team of professionals (McNaughton, 1990; Parette, Hourcade, & VanBierviiet, 1993). This assessment process must include an analysis of *family* function and needs as well as those of the child. However, until relatively recently little research has evaluated the practical (and often unanticipated) impact of technology upon families.

AAC IMPACT ON FAMILIES

Though IDEA mandates that family members be incorporated in team decision-making processes (Parette et al., 1994), parents and family members may hold perspectives on AAC devices that are quite different from those held by professionals (Angelo, Jones, & Kokoska, 1995; Beukelman & Mirenda, 1992; Parette, 1997). As a result, when making recommendations about the potential utilization of AAC devices, failure of the professionals on the multidisciplinary team to appropriately consider child and family preferences can result in an inappropriate prescription of an AAC device (Creech, Kissick, Koski, & Musselwhite, 1988).

The addition of AAC devices into a home can dramatically impact family routines and relationships. Therefore, family values, routines, and resources must be considered in planning for technology services if service plan implementation is to be effective (Brinker, Seifer, & Sameroff, 1994; Gallimore, Weisner, Bernheimer, Guthrie, & Nihira, 1993; Parette, 1994b). Over the past decade, there has been more and more awareness of the importance of evaluating the impact of an AAC device across multiple environments, including the home and other locations where it will actually be used, as opposed to evaluations based upon the isolated usage of the device in a clinical setting (McNaughton, 1990; Parette, 1994a, 1994b; Parette & Angelo, 1996; VanBiervliet, Bradley, & Parette, 1990; Zangari, Lloyd, & Vicker, 1994).

A issue of great interest to many researchers during the AAC assessment process is the degree of stress experienced by families of young children with disabilities (Brinker et al., 1994; Parette, 1991, 1994a, 1994b). A frequent conclusion of this research is that level of family stress in general can be an important mediator of early developmental outcomes (Freidrich, Wilturner, & Cohen, 1985; Hanson & Hanline, 1990).

As part of this growing research base in family stress, the additional levels of stress an AAC device may introduce into the home is receiving greater attention. A number of investigators have speculated on a potential relationship between levels of stress and the introduction of sophisticated electronic and/or medical technology into a home (McNaughton, 1990; Parette, 1994b). For example, investigators have found that families of young children who received assistive devices such as nasogastric tubes must sometimes choose between devices that will (a) have a positive impact on the overall development of their child, but (b) may negatively impact quality of life for the entire family (Brotherson, Oakland, Secrist-Mertz, Litchfield, & Larson, 1995). Thus, in considering the possible implementation of such technologies as AAC devices, families may be asked to consider bringing into their lives technologies that may enhance the functioning of their children, but also will require changes in routines and increased levels of stress (Brotherson, Cook, & Parette, 1996).

It is then paramount in AAC assessment and prescriptive strategies for the multidisciplinary team to acknowledge that while some technological device may enhance the recipient child's functional abilities, it also may require substantial modifications, if not limitations, of family routines and activities (Caldwell, Sirvis, Todaro, & Accouloumre, 1991; Condry, 1989; Parette, 1994a, 1994b). These disruptions of family functioning may adversely affect a family's ability to cope with stress

(VanBiervliet, Parette, & Bradley, 1991; Parette, 1994b), subsequently affecting the child's development (Murphy, 1988a).

The potentially maladaptive impact of the introduction of an AAC device into the home is likely attributable to the pragmatic reality that so often services for children with disabilities involve the child's mother as therapist, teacher, trainer, and transporter for the child. These time-consuming roles may leave little time, money, or energy for the development of normal interpersonal relationships for family members (Doernberg, 1978), perhaps generating breakdown in the family itself (e.g., marital separation or divorce) (VanBiervliet et al., 1991). Assistive technologies may place yet still more burdens upon the child's primary caregiver(s). Given this, it is advisable that the team track the impact on the family following introduction of the device, because the addition of these devices may inadvertently be generating more harm than good.

To put the matter more succinctly, family systems are in some ways like physical systems. Each has only so much energy to direct in meeting needs (VanBiervliet et al., 1991). Families require from external systems (e.g., community and educational services, assistance from extended family and friendship networks, technology services) the kind of assistance that enables the family to most efficiently and effectively use its energy in its own behalf (Caldwell et al., 1991; Shelton, Jeppson, & Johnson, 1987; Thomas, 1986a, b). The wrong kind of technology service may not only fail to enhance a family's functioning, but it can actually be a drain on family energy (VanBiervliet et al., 1991).

Given these and similar concerns, many professionals conservatively advocate caution in the widespread use of assistive technologies for young children who have disabilities in the absence of an adequate research base. Campbell, Bricker, and Esposito (1980) emphasized that indiscriminate use of new technologies will not necessarily result in improved services to children with severe disabilities. Cavalier (1987) suggested that the rush to use existing technologies without an adequate ethical and knowledge base may at times actually impede a child's progress. Practitioners must be aware of when technology truly can assist in meeting identified child needs, and when an overall positive outcome is doubtful (or at least uncertain) (Lahm, 1989). Because assistive technologies typically impact the entire family, it is critical to consider these family factors, including the potential introduction of an additional stressor into the home, before prescribing any assistive technologies. Further, professionals should continue to evaluate the device's ongoing impacts on the family following its introduction.

In overview, then, family factors can play a critical role in the overall success of the introduction of an AAC device into a home. However, it is unclear to what extent family issues are considered during AAC decision-making processes across the U.S. Such information would be important for professionals to help them (a) better understand how practices are implemented across states, and (b) develop more appropriate family-centered AAC strategies which are based on "best practices". A study of national practices would be problematic given the wide range of service entities involved in and strategies used in AAC assessment practices. However, a preliminary study of particular service entities, such as Part H systems, might provide a "window" through which AAC practices could be examined, with implications for future research being drawn for consideration by decision-makers involved in developing more family-centered assessment practices within their states.

PURPOSE AND METHOD

The specific purpose of this study was to survey the 50 states and 8 territories to determine current assessment practices used to prescribe AAC devices for young children with disabilities. For purposes of clarity we targeted the Part H (of IDEA) coordinators of each state and territory of the United States (n = 58) as respondents in the survey.

An instrument was designed to assess AAC assessment and prescriptive practices for young children with disabilities in the respondents' respective states and territories. The survey especially sought to determine the extent of family involvement in the prescription and provision of high-tech AAC assistive technology practices for young children with disabilities. Content of the survey instrument was based on issue areas identified in extensive reviews of the professional literature regarding AAC best practices. Items in the instrument were also drawn from previous assistive technology surveys reported earlier (see e.g., Parette & VanBiervliet, 1990a, 1990d; Parette, VanBiervliet, & Parette, 1990). No validation procedures of the instrument were employed since this study was deemed to be exploratory in nature.

In the survey instructions, if the Part H coordinator was unable to address the questions, he or she was asked to forward it to an appropriate staff person most able to do so. (While this respondent variability had the potential to confound interpretation of the results, the need for information was judged to be of greater significance.)

For purposes of this project, high tech AAC assistive technology was defined in the survey instrument as:

> ... any piece of equipment or product system acquired commercially which uses speech that (a) is prescribed for a young child with a disability; (b) is expensive; and (c) requires training on the part of the child, parents, and professionals to program, use, and maintain. Such augmentative and alternative communication devices may be deemed by many individuals to be "high tech". Examples of these devices would include, but not be limited to Liberator™, System 2000™, and Touch Talker™."

The respondents were asked to identify (a) their professional roles, (b) the number of children with whom they had personally been involved in evaluating for AAC devices during the past year, and (c) the number of IFSP meetings in which they had personally been involved during the past year. The survey instrument then requested information pertaining to (a) the types of services provided to children and family members during or subsequent to the assessment processes; (b) whether or not families participated in AAC assessment processes; (c) factors considered in these assessments; (d) the extent to which family and cultural issues which were addressed; and (e) the extent to which child, technology, and service system characteristics were considered. Two additional mailouts were sent to each recipient who did not respond to the initial mailing of the instrument. In addition, follow-up telephone calls were made to nonrespondents.

RESULTS

A total of 35 survey instruments were returned (60%). Of these, 28 of the returned instruments were completed in usable form (80%). (The remaining 7 respondents reported that AAC assessments were conducted by a wide range of agencies within their respective states and that it would be inappropriate for them to respond on behalf of these agencies.) Some respondents did not answer certain items. Thus, responses may add up to less than 28 on those items. In addition, some respondents indicated multiple responses on certain items, generating totals of more than 100% on those items.

Respondent Backgrounds

In order to maximize participant response, the survey instrument was designed to minimize demographic information provided by respondents, and to direct the attention of respondents to provide exploratory information pertaining to the nature of family-centered practices reflected in their respective states. All geographic regions of the country were represented in the survey. Of the 28 respondents, 12 (43%) were Part H Coordinators, 16 (57%) were Speech/Language Pathologists affiliated with Part H projects, while 2 (7%) reported dual roles. Respondents were asked about the number of infants and toddlers with disabilities with whom they had

TABLE 1
Responses regarding services provided.

In the AAC "high tech" assistive technology assessment processes employed in your state, which of the following services are provided to children during or subsequent to the assessment processes?

	YES, to a great extent	YES, to a limited extent	No	Don't Know
	N %	N %	N %	N %
Purchasing and leasing of devices	7(25)	18(64)	1(4)	2(7)
Customizing and adaptation of devices	6(21)	22(76)	1(4)	0(0)
Repair of devices	5 (18)	14(50)	3(11)	6(21)
Training in the use of devices for the child	10(36)	18(64)	0(0)	0(0)
Training in the use of devices for family members	8(29)	19(68)	1(4)	0(0)
Training in the use of devices for non-family members	9(32)	14(50)	0(0)	5(18)
Coordination of therapies, interventions and services with devices	10(36)	16(57)	0(0)	2(7)

personally been involved in evaluating for AAC devices during the past year. Of this group, 10 individuals (36%) had participated in AAC evaluations during the past year (Range: 3-35 AAC evaluations; Mean = 10). Respondents were also asked to identify the number of IFSPs that they had personally been involved in developing during this time frame. Of this group, 8 individuals (29%) had actually participated in the development of IFSPs (Range: 5-40 IFSP participations; Mean = 19).

Services Provided During or Subsequent to AAC Assessment Processes

Summary data pertaining to responses on items relating to services provided by states during or subsequent to AAC assessment processes are presented in Table 1.

As can be seen, most respondents reported providing a range of assistive technology services. All of these services were more often reported to be offered "to a limited extent" than "to a great extent." Of the potential assistive technology services listed, the most frequently offered included training in the use of the devices for the child; and coordination of therapies, interventions, and services with devices. Repair services were the least frequently offered. A substantial number of respondents reported not knowing whether training for teachers and other non-family members or repair of devices was provided in their respective states.

General Factors Considered During Evaluation

Table 2 presents summary findings of responses related to traditional factors considered during AAC assessment processes. As can be seen, in most states nearly all these factors were considered to either a great or a limited extent. The single factor reported most often to be considered "to a great extent" was the ease with which the device could be used and operated, followed closely by (a) the device's ability to improve the child's functional performance, and (b) the identification of funding streams.

Family/Cultural Issues

Significant respondent variability was found with regard to the consideration of family issues during AAC assessment processes (see Table 3). A particularly interesting finding was that 14% of respondents reported that such factors as (a) family members having to assume additional responsibilities due to the AAC device, (b) how the device might restrict family activities, and (c) the ability of family members to cope with the stress the AAC device might generate were simply not considered in the AAC assessment process.

In addition, a substantial number of

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respondents did not know whether certain family factors were considered, as reflected in a range of 7-36% of individuals reporting 'Don't Know' across the questions noted in Table 3. Cultural issues were reported as being considered only to a limited extent by over half (52%) of the respondents.

Child Characteristics

Most respondents reported that child characteristics were considered to a great extent (see Table 4), with the child's physical ability to use the device, cognitive functioning level, nature and extent of training required for the child to use the device, and degree of integration into community activities receiving greatest emphasis. Interestingly, the child characteristic least likely to receive significant consideration was the child's preference for an AAC device. Only 39% of respondents reported that this characteristic was considered to a great extent, while 14% reported uncertainty whether child preferences for an AAC device were considered.

Technology Characteristics

Presented in Table 5 are summary findings of responses related to technology characteristics considered during AAC assessment processes. Dependability of the device, degree of comfort in using the device, range of devices available, and child/family ability to transport the device, lifespan of the device, and safety and maintenance costs were reported by half or more of respondents to be considered to a great degree. Extent of protection from theft and damage was a factor reported to be considered to a great extent by only three respondents.

TABLE 2
Responses regarding factors considered during AAC assessment processes.

Which of the following factors are considered during AAC "high tech" assistive technology assessment processes?

	YES, to a great extent	YES, to a limited extent	No	Don't Know
	N %	N %	N %	N %
How the device improves functional performance of the child without compromising other areas of performance	19(68)	7(25)	0(0)	2(7)
The reliability of the device		15(54)	12(43)	0(0) 1(4)
The ease with which the device can be used and operated		21(75)	6(21)	0(0) 1(4)
The reasonableness of the service and repair costs for the device	13(46)	10(36)	2(7)	3(11)
Identification of funding streams for purchasing the device	18(64)	8(29)	1(4)	1(4)
Identification of training needs that would enable the child to use the device	14(50)	14(50)	0(0)	0(0)
Identification of training needs that would enable family members to use the device	11(39)	14(50)	0(0)	3(11)
Identification of training needs that would enable paraprofessionals to use the device	6(21)	14(50)	3(11)	5(18)
Identification of training needs that would enable professionals to use the device	9(32)	14(50)	0(0)	5(18)

Service System Characteristics

Table 6 lists the summary findings related to service systems factors considered during AAC, assessment processes. Two factors were considered to a great extent by 50% or more of the respondents. These were (a) identification of funding streams available for purchase of devices, and (b) service personnel available to support provision of the device. Greater variability was reflected in responses related to the extent that policies/procedures can be modified to insure acquisition of the device, with three respondents reporting that this factor was not considered in AAC assessment processes and six respondents indicating that they did not know whether this factor was considered.

DISCUSSION

A number of these findings are especially noteworthy. In terms of services provided (Table 1), we found it interesting that relatively few respondents reported that they provided training "to a great extent" in the uses of the device, either for the child (36%) or for the family members (29%). One then must wonder if adequate training is being provided, and if so, by whom. The apparent relative lack of training provided to children and their families is especially surprising in light of the technological complexity of many of the devices available.

TABLE 3
Responses regarding family/cultural factors considered during AAC assessment processes.

Which of the following family issues are considered in AAC "high tech" assistive technology assessment processes?

	YES, to a great extent	YES, to a limited extent	No	Don't Know
	N %	N %	N %	N %
The extent to which changes in family routine/s will be affected by use or maintenance of the AAC device	11(39)	9(32)	2(7)	6(21)
The extent to which family members will be required to assume additional child care responsibilities in the home by child's use or maintenance of the AAC device	11(39)	6(21)	4(14)	7(25)
The extent to which restrictions in family activities will result through child's use or maintenance of the device	9(21)	6(21)	4(14)	9(32)
The extent to which modifications in the home environment will be required for use or maintenance of the device	9(32)	14(50)	1(4)	4(14)
The ability of family members to cope with stress	6(21)	8(29)	4(14)	10(36)
The extent to which family needs are balanced with existing resources	8(29)	14(50)	1(4)	5(18)
Financial resources that will be required of the family for the child to use and maintain the device	11(39)	11(39)	3(11)	3(11)
The extent to which support personnel and community resources will be available to the family over time for training and maintenance of the device	7(25)	16(57)	1(4)	4(14)
Family preferences for an AAC device	13(46)	13(46)	0(0)	2(7)
Family cultural issues	9(33)	14(52)	0(0)	4(15)

TABLE 4
Responses regarding child characteristics considered during AAC assessment processes.

Which of the following *child* characteristics are considered in AAC "high tech" assistive technology assessment processes?

	YES, to a great extent	YES, to a limited extent	No	Don't Know
	N %	N %	N %	N %
Physical ability to use the device	26(93)	1(4)	0(0)	1(4)
Cognitive functioning level	22(79)	4(14)	0(0)	2(7)
Degree of integration into community activities (including service program) that will be achieved through use of the device	17(61)	10(36)	0(0)	1(4)
Nature and extent of training required for the child to use the device	19(68)	7(25)	0(0)	2(7)
Child's past experiences in using AAC devices	13(46)	12(43)	0(0)	301)
Child preferences for an AAC device	11(39)	12(43)	1(4)	4(14)

TABLE 5
Responses regarding technology features considered during assessment processes.

Which of the following technology characteristics are considered in AAC "high tech" assistive technology assessment processes?

	YES, to a great extent	YES, to a limited extent	No	Don't Know
	N %	N %	N %	N %
Range of devices available	16(57)	11(39)	0(0)	1(3)
Real cost of the devices (includes *hidden* costs, such as repair, maintenance, etc.)	14(50)	10(36)	1(4)	3(11)
Dependability of the device	19(68)	6(21)	1(4)	2(7)
Child/Family ability to transport/move the device across environmental settings	16(57)	10(36)	0(0)	2(7)
Lifespan of the device	15(54)	10(36)	0(0)	3(11)
Usefulness of the device with other equipment (e.g., computers, software)	12(43)	12(43)	1(4)	3(11)
Hands-on opportunities to use the device prior to purchase	13 (46)	11(39)	2(7)	2(7)
Maintenance requirements	10(36)	11(39)	3(11)	4(14)
Extent to which device will be protected from theft and damage	3(11)	10(36)	8(29)	7(25)
Safety features of the device (i.e., will the child/family be safe from injury when using the device)	14(50)	6(21)	3(11)	5(18)
Degree of comfort child/family experience in using the device (i.e., does it cause fatigue, undue physical exertion, etc.)	17(61)	9(32)	1(4)	1(4)
Ease of repair	7(25)	11(39)	4(14)	6(21)

Deficits in preparation for and training in the device can contribute to technology abandonment (Batavia, Dillard, & Phillips, n.d.; Batavia & Hammer, 1990; Dillard, 1989; Parette & Angelo, in press). In technology abandonment, apparently efficacious technologies provided for a child with a disability end up unused and gathering dust within months of its provision. More formally, AAC technology abandonment is characterized by (a) provision of an AAC device subsequent to an evaluation or personal selection process; (b) initial use of the AAC device; (c) growing recognition that it fails to meet the needs of the child and/or family even after attempted modification; (d) increasingly sporadic use of the AAC device, with the child and/or family growing more and more dissatisfied with it until it is no longer used; and (e) choosing another AAC device that more appropriately meets certain needs not met by the previous device. Of course, this new device may generate new problems of its own, at which point the cycle begins again (Batavia & Hammer, 1990; Batavia et al., n.d.; Parette, in press). This problem apparently is a growing one, with technology abandonment reported frequently in the past decade (LeBlanc, 1982; Lifchez, Leiser, Pendleton, & Davis, 1983; Scherer & McKee, 1989; Zola, 1982).

Abandonment of AAC devices on the part of young children and families can occur when technology features are not considered adequately. In this study, less than half of respondents reported that such factors as extent of protection from theft and damage, ease of repair, and maintenance requirements were considered "to a great extent" during assessment processes (see Table 5). However, families often

TABLE 6

Responses regarding technology features considered during AAC assessment processes.

Which of the following service system characteristics are considered in AAC "high tech" assistive technology assessment processes?

	YES, to a great extent	YES, to a limited extent	No	Don't know
	N %	N %	N %	N %
Funding streams available for purchase of the device	21(75)	6(21)	0(0)	1(4)
Service personnel available to support provision of AAC device to child and family	14(50)	12(43)	0(0)	2(7)
Extent to which policies/procedures can be modified to insure acquisition of the device	8(29)	11(39)	3(11)	6(21)
Ability of the service system to follow-up with the family and child within 6 months of provision of the AAC device	11(39)	7(25)	4(14)	6(21)
Ability of the service system to provide training to the family and/or child after the provision of the AAC device	12(43)	9(32)	1(4)	6(21)
Ability of personnel involved in prescribing AAC devices to follow-up on IFSP implementation after provision of the device (18)		12(43)	10(36)	1(4) 5
Ability of the service system to measure family satisfaction with the AAC device	10 (36)	9(32)	4(14)	5(18)

identify these issues as being important to them (Neath, 1993; Parette & VanBiervliet, 1991a, 1991b, 1991c; Parette et al., 1993). If these issues are not adequately considered, dissatisfaction and abandonment may result.

One of the most significant findings was that *none* of the ten family factors listed was reported to be considered "to a great extent" by a majority of the respondents (see Table 3). Given the extraordinary emphasis on families such legislation as PL 99-457 clearly mandated, the apparent failure of so many programs to consider these factors to a great extent was perhaps the most surprising finding in this survey. For example, Brotherson, Cook, and Parette (1996) reported that the home environment may be the most stressful setting in which to use assistive technology devices. Physical changes in the home setting, coupled with changes in home routines to accommodate use of a child's AAC device, can sometimes result in resistance to using new assistive technologies by family members (Parette, Brotherson, Hoge et al., 1996).

Similarly, ability of the family to cope with stress seemed to be considered less frequently, even though the literature suggests that families vary in their abilities to deal with stress (Angelo, 1996; Beckman, 1991; Parette & Angelo, 1996). In a truly family-centered assistive technology approach it would seem that team members should be highly sensitive to the potential effects of increased stress when recommending prescribed interventions for families.

Half of the respondents in the survey also reported that modifications in the home environment was considered to a limited extent, which is interesting given the emphasis of natural settings in family-centered early intervention best practices practices (Noonan & McCormick, 1993; Cook, Tessier, & Klein, 1995).

On a more positive note, 60% of the respondents reported either great or limited extent consideration of family assumption of additional childcare responsibilities when AAC devices are prescribed. Families report that the assumption of additional child care roles may result in hesitancy on their part to use AAC devices, or result in abandonment of devices (Parette, Brotherson, Hoge et al., 1996). Also noteworthy was the finding that financial resources and availability of support personnel over time were frequently considered during AAC decision-making processes. Such issues have historically been considered more frequently by assistive technology team members (Parette et al., 1993). Of particular interest was the finding that most respondents reported the consideration of cultural issues during AAC decision-making. This was surprising given the relatively recent attention that has begun to focus on the importance of culture and assistive technology team strategies (see e.g., Parette, in press: Parette, Brotherson, Hourcade et al., 1996; Soto, Huer, & Taylor, in press).

It may well be that professionals are still adapting to this new family orientation perspective in providing services to young children who have disabilities. During this philosophical transitional period, they may still be restricting their considerations to such traditional factors as child, technology, and service system characteristics (Judge & Parette, in press). This finding is consistent with the perceptions of professionals who have concluded that the importance of family issues in AAC decision-making is only recently being acknowledged (Blackstone, 1993; Parette, 1994a, 1994b; Parette, Brotherson, Hourcade et al., 1996). It is likely that the consideration of family factors at the same level as child, technology, and service system characteristics represents a paradigm shift in professional perspectives which will require time to become more fully completed and assimilated.

These family factors also are intertwined with cultural considerations that increasingly are drawing attention in the professional literature. Such issues as perceptions of disability across cultures, the role of family members in decision making, the importance of verbal communication across contexts, acculturation, social stigma associated with use of devices, and other culturally linked variables have been given little attention during traditional AAC assessment and prescriptive processes. Failure to address such familial/cultural factors may result in the prescription of inappropriate AAC devices which may not be used by children and/or family members because of unrecognized cultural differences.

In considering family factors, professionals must be cognizant of the relatively recent question of whether the introduction of assistive devices into family settings will generate increased and potentially maladaptive levels of stress for family members (Haddad, 1992; Harris, 1988; McNaughton, 1990; Murphy, 1988b; Parette, 1994b). As noted in Table 3, a substantial number of respondents reported consideration of various family issues to a limited extent or not at all. This is particularly problematic given that families have frequently reported having high expectations for AAC devices (Parette, Brotherson, Hoge et al., 1996). These expectations may include that the (a) child will be able to immediately use assistive technology device, (b) child's functioning will change on receipt of device, (c) child will be accepted in the community, (d) child will have immediate and ongoing access to device, (e) child will be more like other children, and (f) device usage will lead to the child's ability to use other devices (e.g., computers) (Parette & Angelo, in press). Once AAC devices are provided to families and young children with disabilities, family expectations might very well be realized. However, realization of these expectations typically require greater involvement on the part of families than many may have anticipated and increased levels of stress and frustration. For example, some families may realize that considerable training will be required to learn to use and maintain the AAC device effectively. Professionals in service settings may be ill prepared to provide the technical training for children and families to use some AAC devices effectively, particularly more sophisticated electronic devices. Even when family members are trained to use electronic AAC devices, they may not know how to teach their children to use them (Parette et al., 1996). Also, there are many assumptions that must be met in the child's natural settings before acceptance of the child who uses an AAC device occurs. Peers and adults with whom the child and family have contact must have information or training regarding use of the AAC device. If not, acceptance of the child may not occur, resulting in dissatisfaction on the part of the family. When families become disillusioned with the AAC device, technology abandonment and adverse child and family outcomes may ensue (Angelo et al., 1993; Parette, 1994b; Parette & Angelo, in press).

In their excitement over the possibilities a new technology may offer a child, professionals must be able to also acknowledge a family might legitimately choose quality of life (i.e., maintenance of their existing, comfortable routines) over the substantial changes in routines that may result from an AAC device prescription (Brotherson et al., 1995; Parette & Brotherson, 1995). A more comprehensive description of the potential impacts of AAC devices on family functioning has been provided by Parette and Angelo (in press).

It is interesting to note that child preferences for AAC devices were considered "to a great extent" by less than half of the respondents (see Table 4). Child preferences routinely have been identified as an integral best practice in the process of selecting appropriate assistive devices for children (Bowe, 1995; Mann & Lane, 1995; Noonan & McCormick, 1993; Parette & VanBiervliet, 1991a, 1991b, 1991c; Parette et al., 1993). Failure to consider child preferences for AAC devices is yet another potential contributing factor in the abandonment of the technology.

The identification of training needs for professionals, for paraprofessionals, and for families were reported to be considered to a lesser degree than other general factors (see Table 2). However, these training needs have also been suggested to be important in the process of assistive technology service delivery (Behrmann, 1995; Gray, 1997; Neath, 1993; Parette, 1991). Without proper training in the use of the increasingly more sophisticated electronic AAC devices, considerable stress and frustration can result.

LIMITATIONS

The limitations of this small preliminary investigation prohibit generalizations to those states participating in the survey and in other states. Only a small number of personnel representing Part H programs responded to the survey. In fact, less than 50% of the states and territories surveyed returned usable questionnaires. A larger sampling of representatives of all agencies and facilities which conduct AAC evaluations in each state would have provided greater information upon which Part H state practices might be examined. Since information regarding specific agencies and groups involved in AAC assessment for young children and their families nationally was not readily accessible, it was felt that Part H Directors would have access to some information, or would forward the instrument to appropriate individuals within each state as requested in the cover letter which was sent to them. However, there is great variability across states regarding the involvement in and understanding of AAC assessment processes by Part H Directors and their staffs. This seems to be reflected in the range of roles reported by respondents. Many Part H Coordinators may not have been in a position to answer the types of questions asked, resulting in other Part H personnel completing forms in their behalf. Overall, only 10 of the respondents had participated in AAC evaluations during the past year and only eight had actually been involved in developing IFSPs. Speech-language pathologists were the only respondents who had actually participated in such assessments and service plan development processes.

Several Project Directors simply returned uncompleted instruments and reported that AAC evaluations were conducted by numerous agencies statewide and that they could not provide composite information. This was interesting since the design of the survey instrument allowed respondents to simply reply that they "did not know" information regarding a particular response. Several states chose to disseminate survey instruments to all agencies known to conduct AAC evaluations and, while responses from many of these agencies were received, they were not included in data analysis. Examination of these completed instruments did suggest that within those states, considerable variability existed regarding the extent to which variables identified on the survey instrument were considered in AAC assessment processes.

Unfortunately, only one item related to cultural issues was included in the survey instrument (see Table 3). Cultural factors were not defined for participants, potentially resulting in many perceptions by those completing survey forms regarding what this item actually meant. Greater specificity regarding the meaning of this statement in the instrument should have been provided to those completing the instruments. Similarly, more items that examined a range of cultural factors deemed to be of importance might have been included.

A final limitation of the study was the reliability of responses to questions used in design of the instrument. Items embedded in the questionnaire were clearly appropriate in light of "best practices" in the early intervention and assistive technology literature, though one must wonder how accurate the answers to such questions would be even if answers were provided by knowledgeable people. It may have been preferable to present questions using a stronger research method that involved such methods as (a) sampling of actual AAC assessments conducted in the various states, (b) document review, (c) interviews with interdisciplinary teams, and (d) other valid strategies for obtaining information.

CONCLUSIONS

Evolving best practices in AAC assessment strategies include information and recommendations that evolve from four factors: the child, the family, the technology, and the service systems. Linkages within and among all these factors should be incorporated into AAC assessment procedures (VanBiervliet, Parette, & Bradley, 1991; Parette, 1994a, 1994b; Parette, Brotherson, Hourcade et al., 1996).

While all four factors play significant roles in the ultimate effectiveness of the prescription of an AAC device, it is perhaps family factors which are most susceptible to being overlooked. It is vital that professionals involved in AAC decision-making understand the critical nature of family factors in the ultimate acceptance or rejection of an AAC device. It may be that family issues receive less assessment consideration due to the lack of training reflected in the personnel preparation programs of related services professionals (Neath, 1993). Additional training in working with families, including developing skills in such areas as partnership-building, consensus-building, interviewing, counseling, consultation, collaboration, goal-setting and decision-making is required if professionals are to most effectively serve young children who have disabilities and their, families (Beukelman & Mirenda, 1992; Donahue-Kilburg, 1992).

The need to prepare or retrain professionals for family-centered AAC programs and services, curriculum development and revision in higher education seems clear (see e.g., Parette & VanBiervliet, 1990a). A first step might be to analyze the four aforementioned factors of the child, the family, the technology, and the service systems; generate from each specific competencies that would qualify family-centered professionals for effective AAC service delivery; and then develop new courses or infuse relevant content into existing coursework and clinical experiences.

An emerging professional need is to learn more about specific outcomes subsequent to comprehensive AAC decision-making. That is, researchers must work hand in hand with practitioners; to determine what combinations of the aforementioned four assessment factors generate what sorts of outcomes with what types of AAC devices. Information obtained from such research will assist related service personnel to more effectively prescribe AAC devices that are appropriate for young children and their families, thus ensuring that existing resources are effectively used.

To this end the U. S. Department of Education has recently funded a special project (Parette & VanBiervliet, 1995) designed to address both family and professional perceptions of AAC impact on family functioning. This study will employ both qualitative and quantitative methodologies to identify specific effects of AAC devices from a family perspective, and will culminate in the development of an interactive decision-making CD-ROM that can be used by related services personnel.

As the costs of AAC devices and associated technologies continue to escalate (or in some cases decline), the need forever more sophisticated and accurate procedures for prescribing these devices likewise will increase. Failures to employ effective procedures to consider all factors appropriately can result in abandonment of the technology, an inefficient use of scarce fiscal resources.

This issue of system resource utilization is currently being debated at the national level (Ballard & Rosado, 1995; Hehir, 1995; Hourcade, Brimer, & Parette, 1996; Opuda, 1995, Parette, Hourcade, & Brimer, 1996). While perhaps theoretically resources should not be considered in these determinations, practically speaking this is typically a significant concern when making decisions about expensive AAC devices for young children with disabilities (Parette, in press; RESNA Technical Assistance Project, 1992, 1994). To the degree, then, that professionals can identify AAC devices beforehand that will receive optimal usage and generate maximum functional effect, these resources will be most efficiently employed.

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Journal of Childhood Communication Disorders
10 (2), 185-199

Teaching Power Through Augmentative Communication: Guidelines for Early Intervention

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"If all my possessions were taken from me with one exception, I would choose to keep the power of communication, for by it I would soon regain all the rest." That statement attributed to Daniel Webster, defines communication as a legitimate avenue of power. For the nonspeaking person, communication power is extremely limited and, when compounded by a physical impairment, forces the nonspeaking person to relinquish a significant degree of power.

A loss of communicative and physical power often results in learned helplessness. This helplessness develops at an early age (Harris, 1982) since most nonspeaking, physically impaired children do not have the power of normal movement. What they do demonstrate is the power to resist what they cannot alter and the power to manipulate others through behavior. One of the keys to channeling power appropriately with a nonspeaking, physically impaired child is to train parents and primary caregivers to implement augmentative communication strategies and systems as part of their child's normal routine (Light, Collier, & Parnes, 1985a,b,c).

Although most parents are open to use of an augmentative communication system, many parents are unsure of the appropriate time to begin use of a system (Culp, 1982). The parents of a child who has not reached school age may not have considered it necessary to begin a formal augmentative communication system. Often because of their unfamiliarity with the field, they may cite any of the following statements and questions:

- "If we start an augmentative system, my child may not learn to talk."
- "My child is too young to understand."
- "But, I understand what my child wants."
- "Are you sure an augmentative communication system will not slow down my child's development?"

Most parents want their nonspeaking, physically impaired child to work towards skills that normal children attain, such as the ability to move freely, communicate effectively, and achieve an education. A survey of parents' goals for their children reflects their top priority as being communication (Van Tatenhove, 1987) with secondary goals as academic achievement, physical development, and socialization.

While there is a trend toward similarities in goals, most parents tend to view their nonspeaking child as unique and unlike any other child encountered. Because that attitude is not atypical, it is helpful to reassure them that research supports the following five principles:

1. Use of an augmentative communication system reinforces use of oral communication and does not negatively influence development of speech (McDonald, 1980). Use of the child's voice and speech should always be encouraged because oral communication skills are a necessary form of communication, regardless of the potential degree of intelligibility.
2. Failure in communication can occur extremely early and adds to the child's handicapping condition. The child, from birth, presents unintentional communicative signals (McLean & Synder-McLean, 1978; Dunst & Lowe, 1986) which are shaped into intentional signals when the adult responds. Early augmentative communication intervention simply offers a systematic means of channeling these communicative signals.
3. Many communication signals sent by a nonspeaking child are misinterpreted or missed by the potential communication

partner (Light, Collier, & Parnes, 1985c). In addition, partners anticipate needs of the child. The constant anticipation and misreading of the child's needs prevents normal communicative turn taking and fosters learned helplessness.

4. Many augmentative communication systems promote cognitive development, such as causality and mean-ends understanding (Musselwhite & St. Louis, 1982), and enhance visual skills, such as scanning and discrimination.
5. The child dependent on his communication system comes to recognize its power. That child is better able to interact socially and transitions more easily to a variety of academic and community settings (Anderson & O'Brien, 1983).
6. Early intervention with an augmentative communication system is supported as a means of preventive treatment, for without a system, many children fail to develop the communication and language abilities needed to interact effectively and participate fully in academic settings (Reichle & Karlan, 1985).

ASSESSMENT OF NEED

An election decision matrix developed by Shane and Bashir (1980) lists ten critical factors which must be evaluated to determine a student's candidacy for an augmentative communication system. These factors include the individual's cognitive level, oral-motor abilities, language development, chronological age, and effects of previous therapy. The matrix suggests that implementation of an augmentative communication system be delayed if an individual does not demonstrate a mental age of 18 months or if that individual exhibits potential to imitate speech sounds or words. However, according to Yorkston and Karlan (1986), "many of the assumptions underlying the candidacy issue have been challenged. The alternative position holds that having a severe expressive communication deficit or being 'at risk' for developing one is sufficient reason for serious consideration of communication augmentation."

For the child under 12 months of age, high risk indicators may include feeding difficulties, irregular breathing, and lack of oral play. Each of these factors suggests potentially deficit oral-motor control for speech development (Morris, 1982). In addition abnormal gross motor development suggests possible overall motor problems which may influence speech development.

The high risk indicators for a child between 12 and 24 months include the presence and persistence of primitive oral reflexes, development of compensatory abnormal oral movements, overflow of muscle tension or movements to the mouth when the child moves his body, lack of disassociated movements between the child's mouth and body, vocal or laryngeal blocking, poor coordination of respiration with feeding or vocalizations, and emerging speech abnormally unintelligible. Each of these factors reflects difficulties with motor control and interaction between respiration, phonation, resonation, and articulation. In addition, continued reliance on nonlanguage systems to communicate when speech should be assuming more dominance suggests beginning cognitive awareness of the inefficiency of the child's oral communication system.

Between the ages of 24 and 36 months, the high risk indicators shift from a motor base to an interaction base. Although continued poor oral-motor coordination; limited intelligibility; and difficulties with the processes of respiration, phonation, resonation and articulation remain critical indicators, evidence of communication frustration, learned helplessness, and a widening receptive-expressive language gap are increasingly more pronounced high risk indicators. These three factors suggest the child's awareness of his communication failures.

Few nonspeaking, physically impaired children present only one or two of the above high risk indicators in isolation. Because the motor components are inter-related, one of the motor indicators is usually accompanied by the associated indicators. The interaction/language indicators are more likely to vary in their presence or absence based on the child's age and associated handicapping conditions. For example, a child who is chronologically 30 months old, but who demonstrates a profile of cognitive skills more typical of a 12 month old may not demonstrate communication frustration, but may have a high degree of learned helplessness. The child who presents any number or combination of the above high risk indicators should be evaluated for potential use of an augmentative communication system.

ASSESSMENT PROCESS

Successful use of an augmentative communication system must be based on the selection of an appropriate system and a clear definition of the relationship between use of the system and use of the child's oral and nonlanguage (e.g., facial expressions, gestures, changes in muscle tone) communication approaches. Vanderheiden and Yoder (1986) suggest that all persons use augmentative communication techniques and urge that use of a system be kept in balance with all the other techniques normal persons use to communicate. Light, Collier, and Parnes (1985c) also stress assessment of all modes of communication used by the non-speaking child.

A full scope evaluation for a nonspeaking, physically impaired child below the age of three should be completed by a multidisciplinary team including a physical therapist, occupational therapist, speech-language clinician, early childhood specialist or teacher, and parent. As with selection of an augmentative communication system for an older child or adult, the team must determine the child's best method of indicating a response (e.g., finger pointing, eye pointing, use of a switch to an end device), cognitive skills relative to operation of a system, level of symbolic representation, and communication interaction abilities. Relative to the child under the age of three, the team must thoroughly evaluate motor potential and long-term effects of selected motor patterns. They need to weigh both cognitive and communicative abilities against expected skills for the child's chronological age and design an appropriate augmentative communication system.

Yorkston and Karlan (1986) present three general assessment approaches which are applicable when assessing a young child at risk for developing functional speech: (1) the capability profiling approach, (2) the criterion-based approach, and (3) the predictive approach. The capability profiling approach involves the identification of the maximum level, of performance in areas of interest relative to the individual's needs and components of a proposed communication system. This assessment approach is comprehensive and appreciates the individual's unique skills. In addition, this approach views the skills developed in the individual as inter-related and interaction between the components as part of the natural course of development.

The criterion-based approach (Beukelman, Yorkston, & Dowden, 1985) is interested in identifying whether the individual meets minimal criterion for use of a specific communication system. The predictive approach is based on a number of carefully constructed tasks and the individual's performance on these tasks is used to predict their ability to utilize a specific communication system.

No literature supports one specific assessment approach for a non-speaking, physically impaired child who is below the age of three and may present additional handicapping conditions, such as mental retardation, visual impairment, or hearing loss. Any team which is faced with evaluating the nonspeaking child below the age of three must be prepared to use a combination of approaches, modify standardized assessment tools and generate sampling techniques or observation guidelines. Procedures and approaches are published which guide a team in the overall assessment process (State of Florida, Department of Education, 1985).

When developing a profile of a student's abilities, three areas are of critical concern when assessing a child below the age of three. These three areas include means-ends understanding, causality, and symbolic representation. Means-ends understanding and causality relate to the child's understanding of a tool, such as a head pointer or switch, to control a communication device which controls the response of another person. Symbolic representation refers to the ability of a child to recognize that an object, photograph, or picture can represent an object or idea which the child can communicate and receive. Each of these skills have their base in the sensori-motor stage of cognitive development and do not develop in isolation from each other or other skill areas also developing in this period (Ginsberg and Opper, 1969). A thorough assessment of the child will assess a wide variety of skills which develop in a child from birth to approximately two years, but may need to focus on specific skills which appear most directly related to use of an augmentative communication system.

Means-Ends Understanding

The topic of the relationship between means-ends understanding and switch use has been discussed extensively among professionals. Although no published research is available connecting specific cognitive levels with ability to operate specific switches or communication devices, it has been suggested (Van Tatenhove, 1984) that switches and switch use be analyzed based on normal cognitive development. This suggestion has triggered researchers to probe this issue more fully (Egan, 1987).

Normal development suggests that children below the age of three progress through a series of skills as they learn how their bodies work, how their bodies work on other objects, and how the objects they control work on other objects (Piaget, 1972). The child initially must be in direct contact with the end result and gradually understands more indirect control through use of tools. To assess the student's level of tool use refinement, as it relates to an augmentative communication system, consider evaluating the child's understanding of switch controlled toys and electronic devices as follows:

- Present a toy or device operated through a switch which the child directly contacts.
- Place both the toy and switch within the child's immediate visual field. Ensure the cord connecting the switch to the toy is also visible.
- If necessary, due to the child's physical impairment, assist him in accessing the switch.
- Verbally draw the connection between the switch and the toy while demonstrating that the action on the switch results in action on the toy.
- After initial demonstrations, allow the child to attempt to activate the switch and toy.
- Allow the child practice time to develop the association between the switch and toy.

Three typical responses are noted in reaction to the above task and are listed below:

- Level A: The child focused the majority of his attention on his action on the switch and appeared surprised (repeatedly) at the result on the toy.
- Level B: The child alternated his attention between the switch and the toy. He watched his action on the switch as he activated it, but indicated awareness, through anticipation, of the resulting effect on the toy.
- Level C: The child maintained his focus on the toy while activating the switch. He disregarded switch operation to place his full attention on the toy.

These levels do not denote criteria for acceptance or rejection of an augmentative communication system; rather, they define entry level skills and necessary components of the selected system. The child who reacts at skill Level A will not exhibit readiness for interactive use of a switch controlled system or a manual system which requires use of a tool. The Level A child might be a candidate for a system which allows him more direct control and contact. For example, the child could use a system which allows him to eye point to or touch the object of his choice The Level B child is beginning to develop the association between his action on the switch and the resulting effect on the toy,. but like the Level A child, would benefit from additional switch use experience. It is not until the child reaches Level C that immediate use of a switch controlled system is a viable option.

Causality

It is undesirable and virtually impossible to separate means-ends understanding from causality because their relationship with use of an augmentative communication system is intricately inter-related. All augmentative communication devices, whether switch-controlled or manually operated, are tools themselves in order to effect responses from others, as well as being a means to control interaction. The student with a manual communication system, in the form of a communication board, must recognize the manual device as an important tool to control others; while the student with a switch-controlled system must recognize his switch as a tool to control his device and his device as a second tool to control others.

The child who has limited understanding of objects as tools is often the one who uses unaided communication strategies, such as vocalizing for attention, eye pointing to objects in the environment. and natural gesturing. These skills would indicate that the child has learned ways to control adults and the question arises as to whether he can extend that understanding when using an aided communication system. To answer this question, the evaluation team should document the unaided communication strategies used by the child and assess the child's ability to extend control through a communication device. Through observation, document the child's unaided communication strategies by noting:

- whether the child exhibits alternate eye gaze patterns; i.e., looks at desired object, looks at a communication partner, and returns look to the desired object.
- whether he consistently uses his voice, gestures, or noise maker to gain attention intentionally.
- whether there are emerging intentional communicative functions or reasons for which the child uses his voice, gestures, and body.

Assess the child's communicative control by utilizing a device accessed directly. Have the child use a switch-controlled electronic device only if the child demonstrated Level C means-ends skills. If using a manual communication device, such as a vertical Lexan panel with a center window cut out, use the following sequence:

- Present the device to the child, placing it between the examiner and the child.
- Place a toy in each corner of the panel.
- From the child's perspective, scan each toy from left to right and top to bottom.
- Cue the child to look at one object.
- Remove the toy from the device, play with it with the child for a brief period of time, and replace it.
- Repeat the scanning sequence for each of the four objects and wait for the child to respond.

Typical response levels include:

- Level A: The child looks at the adult without regard to the objects displayed on the device.
- Level B: The child looks at a desired object, but does not return gaze to the adult.
- Level C: The child alternates his look between the adult and the desired object.

The level of the child's responses will influence the interaction style used by his communication partner. If the child does not look at the objects on the display, repeated cues will be needed to help that child scan each of the choices presented. The child who does not return gaze to the adult will need verbal cues to "Look back to me" to recognize the adult as a valuable communication partner. The Level C child will need few extra cues to direct messages to his communication partner intentionally.

Representation Symbols

Use of aided communication systems places heavy emphasis on development of graphic symbols. While many assessment approaches emphasize identification of these symbols by label (e.g., Find the picture of the shoe) less emphasis is being placed on the nonspeaking child's need to identify objects, photographs, or pictures (OPP) by language label. Rather, the new focus is on assessing whether the child recognizes that the OPP to which he looks, points, or scans represents the object which he will receive. Object identification by label influences ability to match objects to photographs and pictures, but is not evidenced as mandatory for the photograph or picture to serve as a representational symbol for the child (Sevcik & Romski, 1986).

Not all children below the age of three will be able to complete matching tasks following verbal directions. For those students who have those skills intact, standard approaches (e.g., find one like this) can be used; however, alternative procedures are necessary to elicit a matching response from children who do not understand the language of a matching task.

- Present two objects to a child, possibly displaying them on a vertical Lexan panel or in containers on a wheelchair laptray. Select one colorful, interesting looking toy (e.g., a wind-up walking Jack-in-the-box and a second, less attractive toy which is highly dissimilar in shape and color.
- Begin playing with an exact replica of the attractive toy, watching the child's response.
- Note whether the child looks to the matching toy located on the panel or laptray or watches the one held by the examiner.
- Hide the object held by the examiner and note whether the child looks to the matching object.
- Vary the toys used, using pairs which are highly dissimilar and similar in color and shape. This elicits information not only on the student's matching abilities, but also his visual perception and discrimination.

The child who matches object-to-object should be evaluated for his ability to match photograph-to-object and picture-to-object. When selecting photographs and pictures for this assessment, use ones which are clear, boldly colored, and have distinct features. Avoid cluttered and abstract drawings.

Assessment Summary

Not all nonspeaking, physically impaired children below the age of three will be ready for use of an augmentative communication device; however, augmentative communication strategies can be implemented to prepare the child for future use of a device. The younger the child, the more likely it will be that he will lack the necessary skills to use a traditional, aided augmentative communication system. However, even for the child who is not ready for a device, the evaluation procedures outlined help focus the attention of parents and professionals on areas critical to the future communication development of their child.

TREATMENT

While it is the responsibility of the evaluation team to select the best augmentative communication system, it typically falls upon the parent, or other primary caregiver, to implement interactive use of the system. Based on projects which have studied the interactive patterns between adults and nonspeaking children (McDonald, 1985), there are six adult interaction patterns which should be avoided. These patterns reflect that (a) adults dominate turns, (b) allow the child few opportunities to communicate, (c) often fail to produce language models at a level the child is capable of reproducing, (d) rarely expect the child to communicate, (e) expect communicative functions and performance far above the child's abilities, and (f) relegate the child to the role of responder. Communication too often has more of a crisis need function (e.g., to find out why the child is crying) than a social exchange function.

In addition, this author's experience with nonspeaking children below the age of three indicates that most nonspeaking, physically impaired children are (a) communicatively apathetic by age two; (b) do not know what it means to control their body, objects, or other people; (c) do not know what it means to interact effectively and independently; and (d) do not know how their unintentional communicative signals are being interpreted by others. Therefore, the primary goals of augmentative communication intervention with the nonspeaking child below the age of three is two-fold: (1) to teach the child the power and control he exercises through communication and (2) to teach the parents effective communication interaction patterns with their child.

General Treatment Approach

In many ways, young children learn through play. The learn about the properties of objects, the versatility of sounds and words, and rules of effective interaction. Because of the value of play to learn, augmentative communication treatment for the young child should also be play-based, with parents, siblings, and primary caregivers serving as chief playmates. The selected augmentative communication strategies and aids serve as a critical part of the play routine. For example, for the child who eye points to objects on a vertical Lexan panel, the adult and child can play "bathe and dress dolly" by placing and interchanging objects on the display as needed. Both the child and adult can take turns caring for dolly, with the adult using the activity to teach vocabulary, concepts, choice making, and interactive turn talking. All family members should be encouraged to evaluate their home environment and organize everyday household activities (e.g., bath time, snack time, sand box) to promote communication.

Given guidance, parents are creative in developing natural communication opportunities for their child. For example, one parent trained in these techniques placed a magnetic mirror on the refrigerator and placed food magnets equidistant around the outside edge of the mirror. The mother positioned her two year old child's face in line with the mirror so the mother could interpret her daughter's eye point. Her daughter selected her afternoon snack by looking at the magnet of the desired food and then looking back at the mirror to direct her request back to her mother. Similar communication opportunities were established by placing choices in the bathroom tub area affixed to the tile with small suction cups, on the outside of the toy box, and next to the crib. This creative parent turned key activity areas of their home into communication stations and designed their home as if it were one large communication device.

Professionals working with nonspeaking children must train all primary caregivers, including grandparents, siblings, babysitters, and neighbors. Emphasize the child's current communication pattern; consistency in the auditory, visual. and language cues used; and relaxed, natural interaction with the system. Teach use of normal, yet precise language modeling and verbal reinforcement of the augmentative system. Because the physically impaired, nonspeaking child often has no means to provide accurate feedback to the adult regarding the language understood, adults may speak to them in longer, more complicated sentence forms than the child can comprehend. Therefore, remind adults of the need to tell the child the names of objects, describe how objects are used, and relate how one object is associated with other objects. Finally, guide the physically impaired child in completion of motor acts which give him power and control over objects. This helps set the base for understanding control through communication.

Pre-Device Communication Goals

The child not yet ready to use a communication device can learn early augmentative communication strategies designed to develop awareness of communicative signals. Such a child typically uses signals, such as looking, smiling, and changing muscle tone, which are interpreted by adults as having a specific communicative meaning. Therefore, it becomes necessary to make explicit to the child that he is engaged in intentional communicative signaling (e.g., I see you looking at your bottle. You want a drink?). Stress to the parent that all children use unintentional, nonlinguistic signals and must learn how to use intentional linguistic signals (McLean & Synder-McLean, 1978). By explaining to their child what he is doing with his face, eyes, body, or voice, the parent is promoting more normal communication development. The parent is also strengthening their child's future, language-based communication with an augmentative communication system. As a side benefit for the parent and family, there is increased awareness of the child's multi-modal means of communication. This aids the parent in balancing use of an augmentative communication system with the hierarchy of other nonlinguistic systems their child uses (e.g., voice, changes in muscle tone). Fear of replacing speech with an augmentative system is eliminated, while acceptance of a system is promoted.

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Initial Device Communication Goals

The initial communication device for a physically impaired child under the chronological age of three has typically been an uncomplicated device, such as a simple manual communication board with brightly colored pictures or photographs. However, introduction of portable, user and custom programmable devices with synthetic speech output are being suggested as appropriate tools to develop communication interaction with young children (Baker, 1985). However, electronic devices are not recommended if the child lacks the cognitive and motor skills to utilize it functionally. Therefore, few electronic devices are being used on a daily basis by the nonspeaking child under the age of three.

This child's initial device is likely to be a variation of a manual communication board: i.e., a small, fold-up display; a Lexan panel; or a communication book. Whatever design is determined to be most appropriate, the first goal is to reinforce use of the device as a new option in the child's hierarchy of communication systems. To stress the utility of the device, use statements such as "I see you using your board. Now I understand you." It is unwise to give conflicting statements which defeat the use of the device (e.g., "I know you want your juice. Show me juice on your board"). Such a statement indicates to the child that his unaided communication attempt was successful, but the device must be used to exercise location of requested vocabulary. This type of feedback does not promote aided communication and strips the device of its communication power. Encourage device use by acknowledging general understanding of the unaided communication, while expecting specific communication with the device (e.g., "I know you want a drink. I see you looking at the refrigerator. What kind do you want? Show me with your board"). This teaches the child the speed and communicative efficiency of using his device as an initial avenue of communication, instead of utilizing it as a last resort.

Efficient use of an initial communication device requires systematic scanning of the items on the display, followed by a controlled, reliable, and readable access. Use visual and auditory cues to teach the child to scan the communication display from the child's left to right and top to bottom. Tap or scan along each choice with one finger, verbally cueing the child to "Look here." Scan slowly and precisely, keeping unnecessary talking to a minimum. Reinforce the child for scanning the display and withdraw cues as the child learns the scanning pattern. For children with immature visual systems, contact the child's occupational therapist or opthalmologist for guidelines in modifying the visual requirements of the communication system.

To emphasize accurate accessing of messages, do not allow the child to become haphazard or careless. When his selections are unclear, his communication partner must guess which target was selected and often has to ask clarifying questions. Early emphasis on accurate accessing will transfer to use of future devices which may require finer and faster movements.

To make use of a communication device as convenient and practical as possible, it is desired that the child at least match objects to photographs or objects to pictures. This allows semi-permanent displays to be developed and eliminates the need to be continually building and replacing the actual items on a display. However, it is not mandatory since the child's initial communication device could display objects. When using objects, teach the child to communicate choices by placing the actual object on the display. Give the object to the child after he looks or points to it. Progress to object-to-object representation by placing the child's favorite objects on the display and, after he requests an object, giving him a second, matching object. Transition to use of photographs by adding a photograph above the object on the communication display. Experiment with removing the object when the choice is represented in photograph form. Photograph-to-object association is confirmed by completing matching activities outside of the communication interaction activity. Finally, introduce color pictures which closely resemble the actual objects used. Reinforce the representational association by saying "I see you looking at the photograph/picture of x. Here is the x." Draw the association between the photograph/picture and the object and give the child the object.

The child's initial experience with his communication device can be overwhelming. To promote success, start with a limited number of choices interspersed in a logical pattern across the display (e.g., in a checkerboard, in the four corners of a Lexan panel). The exact number and location of targets will be based on the child's unique abilities. As experience is gained, expand the number of available messages. In addition, provide vocabulary and plan activities which promote not only choice making, but initiation of requests, comments, and questions. All too often, the device is used only for choice making which limits the child to only one of a range of reasons to communicate.

SUMMARY

Many of the suggestions for developing an augmentative communication system with a physically impaired child under the age of three appear practical and common. For the parent or professional working with this child, implementation of an augmentative communication system should not be a frightening or difficult experience. When approached openly, use of a system with a child under the age of three can promote communication and interaction, drawing on the child's current abilities and future potential. It is a vehicle to give the child the power to control his environment and is not intended to be restrictive or inconvenient. Although much research is still needed in the area of early intervention with augmentative communication systems, experience indicates that this early intervention promotes the communicative competence of the nonspeaking, physically impaired child.

As research documents the clinical experience of the efficiency of early intervention, parents will more often be called upon to provide the treatment services. Parents, when designated as the primary facilitators, may need structured training in good language modeling techniques and interaction strategies which promote the active communication participation of their child. With training and support, parents can be effective, creative, and insightful communication facilitators.

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